

M-Phi

A blog dedicated to mathematical philosophy.

Monday, 3 October 2011

The (in)consistency of PA and consensus in mathematics

(Cross-posted at [NewAPPS](#))

Last week, the foundations of mathematics community was shaken by yet another [claim of the inconsistency of Peano Arithmetic \(PA\)](#). This time, it was put forward by Edward Nelson, professor of mathematics in Princeton, who claimed to have found a proof of the inconsistency of PA. A few months ago, quite some stir had been caused when Fields medalist V. Voevodsky seemed to be saying that the [consistency of PA was an open question](#); but Nelson's claim was much more radical; he claimed to have proved that PA was outright inconsistent! (Here is a [great post by Jeff Ketland](#) with a crash-course on PA and a discussion of ways in which it might be inconsistent.)

Nelson announced his results on the FOM mailing list on September 26th 2011, providing links to two formulations of the proof: one in book form and one in short-summary form. Very quickly, a few math-oriented blogs had posts up on the topic; we all wanted to understand the outlines of Nelson's purported proof, and most of us bet all our money on the possibility that there must be a mistake in the proof. External evidence strongly suggests that PA is consistent, in particular in that so many robust mathematical results would have to be revised if PA were inconsistent (not to mention several proofs of the consistency of arithmetic in alternative systems, such as Gentzen's proofs -- see [here](#)).

Indeed, it did not take long for someone to find an apparent loophole in Nelson's purported proof, and not just someone: math prodigy and Fields medalist [Terence Tao](#) (UCLA), who is considered by many as the most brilliant mathematician currently in activity. The venue in which Tao first formulated his reservations was somewhat original: on the [G+ thread opened](#) by John Baez on the topic. (So those who dismiss social networks as a pure waste of time have at least one occurrence of actual top-notch science being done in a social network to worry about!) At the same time, Daniel Tausk, a professor of mathematics at the University of São Paulo, had identified the same mistake in Nelson's argument, and alerted Nelson of the problem in private communication. Judging from his replies (which can be read in the [FOM archive](#) as well as in [The n-Category Café post](#)), Nelson did not immediately understand the objection, but within a few days consensus had emerged that the mistake identified by Tao and Tausk was irreparable. Then, on October 1st, Nelson graciously acknowledged the correctness of the objections and [withdrew the claim](#) of having a proof of the inconsistency of PA. As has been remarked by many commentators, it is certainly a sign of mathematical greatness to acknowledge one's own mistakes so promptly!

While it must have taken true mathematical insight to see what was wrong with the purported proof, once the mistake was spotted, it was actually not overly difficult to understand – if not in all its technical details, which presuppose a good understanding of Chaitin's theorem, at least in its basic idea: it was based on the unwarranted assumption that the hierarchy of sub-theories built for the proof is going to map neatly into the hierarchy of the Kolmogorov complexity of each of these sub-theories. In the game of mathematics, tacitly relying on assumptions is not a good move, even less so when it turns out that the assumption is false.

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From the point of view of the social practice of mathematics, this episode raises a number of interesting questions, which can be framed from the point of view of Jody Azzouni's insightful analysis of [how and why mathematics is unique as a social practice](#). Azzouni argues that mathematics is one of the most homogeneous groups of human practices around, and in particular one which seems particularly favorable for the emergence of *consensus*. Indeed, mathematicians virtually always agree on whether a purported proof is or is not a valid mathematical proof; it may take a while for enough members of the community to understand its details (as with Deolalikar's purported proof of $P \neq NP$ last year, but this was mostly because the latter was rather poorly formulated), but past this initial period, consensus virtually always emerges. (To be clear, there can be disagreement on whether a proof is elegant, interesting etc., but not as to its correctness and incorrectness.) This remains a very puzzling feature of mathematical practice, which at least to some people suggests that Platonism is the only plausible philosophical account of mathematical truth.

The swiftness with which consensus emerged as to what was wrong with Nelson's purported proof is yet another example of the strong tendency towards consensus in mathematical practice – and arguably, it cannot be fully explained as a merely socially imposed kind of consensus, due to homogeneous 'indoctrination' by means of mathematical education. That it only took a few days for consensus to emerge naturally also depends crucially on the technologies of information dissemination currently at our disposal – mailing lists, home-pages, blogs, social networks; but more generally, the episode has been a dramatic but classical occurrence of a well known pattern in mathematics as a social practice.

The comparison with another dramatic claim, put forward for the first time more than 80 years ago, may prove to be informative. Indeed, the reception of Gödel's incompleteness results (which has been extensively studied by Dawson and Mancosu, among others) also illustrates the emergence of a consensus, but this time it favored the highly surprising claim being put forward; in last week's episode, by contrast, the highly surprising claim has been refuted.

In September 1930, Gödel made the first public announcement of his incompleteness result. In first instance, he had proved only the first incompleteness theorem, and as is well known, from the first theorem the second incompleteness theorem was proved independently by Gödel himself and by John von Neumann. But von Neumann was one of the few who immediately understood the result (Bernays and Carnap seem to have struggled); in fact, he may have been the first to see the far-reaching consequences it had. In particular, while Gödel was still rather cautious regarding the impact of his results for Hilbert's program, von Neumann immediately drew the right conclusions. However, quite a few mathematicians were so taken aback by Gödel's results that they were convinced that there must have been a mistake somewhere in the proof; just as in last week's episode, many of them set out to find out the 'loophole' in Gödel's proof, but on that occasion to no avail. As narrated in [this wonderful paper by P. Mancosu](#), the news of Gödel's results quickly spread, but in the absence of the WWW or similar platforms, many people did not have immediate access to off-prints of the paper where the results were presented. For example, before seeing the actual results in detail, mathematician Leon Chwistek suspected that Gödel's proof would be based on misunderstandings, but once he read the actual paper, he stood corrected:

In my last letter I have raised some doubts concerning Dr Gödel's work that have completely disappeared after a more attentive study of the problem. I had at first thought that there was a tacit introduction of non-predicative functions which makes the use of a rigorous symbolical procedure impossible and I even feared the possibility of an antinomy. Now I see that this is out of the question. The method is truly wonderful and it fits pure type theory thoroughly. (Letter to Kaufmann, in Mancosu 1999, 44)

Both the consensus that eventually emerged concerning the correctness of Gödel's surprising results, and the consensus swiftly established as to what was wrong with Nelson's purported proof last week are examples of the amazing and quite

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The Hidden Abacus

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many senses, the most pressing task for the philosophy of mathematics, practice-based or otherwise, is to formulate a satisfactory account of this almost eerie fact about mathematics.

Published by Catarina at 10:13 am

868 comments:

Seamus 3 October 2011 at 11:40

It would be interesting to also contrast these two episodes with the recent P != NP "proof" that got some press...

Reply

Catarina 3 October 2011 at 11:51

@Seamus, it would indeed, but I'm afraid it's not going to be done by me... I haven't followed the P != NP controversy from very close last year, and the topic is too far removed from the areas I feel confident I'll be saying something sensible on.

Reply

Replies

John Mooler 31 May 2020 at 18:24

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Reply

Roger Witte 3 October 2011 at 12:37

I suspect that history (ie people) tend to remember episodes where the surprising suggestion turns out to be true better than when the surprising claim turns out to be false.

Reply

Anonymous 4 October 2011 at 07:02

It's amazing how someone can come along and in a matter of minutes falsify a proof which must have taken Nelson hundreds of man hours to construct.

And should the original claim have been less bold and more carefully checked before publishing to avoid humiliation and publicity?

Reply

John Huerta 4 October 2011 at 07:11

Great post! As a mathematician, I find the relative ease of consensus wonderful and mysterious.

Maybe I'm reading too much into your words, but it seems like you would argue that consensus in mathematics is both easier and swifter than consensus in other sciences like, say, physics. Yet the eventual arrival at consensus is an important

- Sara L. Uckelman
- Thomas Meier
- Unknown
- Unknown
- Unknown
- Vincenzo Crupi
- Wes Holliday
- mszn
- sophie

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parts of physics that haven't yet made contact with experiment, and focus on a subfield where theory and experiment see constant interplay, such as condensed matter.)

It is understandable that consensus in physics would take longer than mathematics: it is an experimental science, and experiments take time. But are there any qualitative differences in consensus in physics, once it is reached, from consensus in mathematics?

Reply

Anonymous 4 October 2011 at 08:21

"who is considered by many as the most brilliant mathematician currently in activity."

No serious professional mathematician would accept such a description of any mathematician.

Reply

Replies

Anonymous 4 June 2020 at 16:11

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Reply

Anonymous 4 October 2011 at 14:38

"who is considered by many as the most brilliant mathematician currently in activity."

No serious professional mathematician would accept such a description of any mathematician. "

Funny. I thought Bernoulli believed such a thing about Newton.

Reply

David Corfield 4 October 2011 at 17:24

With regard to your final paragraph on the "most pressing task for the philosophy of mathematics", I can sympathise with that thought, and yet a huge amount of effort has already been devoted to it. Alongside the justification of formalisms by more orthodox philosophy of mathematics, on the practice-based side we have, say, Ken Manders on the control afforded by Euclidean diagrammatic reasoning in 'The Euclidean Diagram' (1995) and Colin McLarty in *Voir Dire in the case of mathematical progress* describing the advent of shared means of rigorous expression in the twentieth century.

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Followers

To my mind, an equally or more pressing task is to understand the kinds of slowly emerging consensus that occur as to what directions a field of mathematics should take. With the very light constraints afforded by logical correctness or empirical adequacy, there's some explaining to do.

[Reply](#)

Catarina 4 October 2011 at 22:50

@John,

Indeed, it seems to me that there is a stronger tendency towards consensus in math than in, say, physics, but that's ultimately an empirical claim of course (the 'sociology' of each of these fields). And it's precisely the fact that math is not an experimental science that makes consensus even more puzzling: there isn't anything like, you know, the physical world, to keep mathematical practice in check!

[Reply](#)

Catarina 4 October 2011 at 22:54

@David,

I guess I should have said "the most pressing task for the philosophy of mathematics ... REMAINS to formulate a satisfactory account...". You are absolutely right that there has been a lot of work on the topic, but to my mind it is still essentially an open question.

The higher level question that you mention, i.e. the directions a field of mathematics should take, is definitely also very interesting, but certainly just as hard or even harder! :)

[Reply](#)

Anonymous 4 October 2011 at 23:16

What exactly is it that you find so mysterious about the strong tendency towards consensus? A naive answer might be that we have a clear notion of what a proof is, and therefore a watertight test that we can apply to claims of mathematical correctness. To the objection that fully detailed and rigorous proofs are never in practice written out, I would answer that mathematicians are trained to know how to take any part of a mathematical write-up and, if it is correct, expand it into something more formal and detailed -- a process that can be iterated if necessary. Experts in different areas get a feel for what is likely to be true in their area, so if an incorrect proof appears, and is of a sufficiently important result, they will usually (but not always) know which part needs to be clarified. Surprisingly often, the mistake is a simple unjustified assertion that the author mistakenly thinks is obvious and a more sceptical reader doesn't find obvious at all.

I'm curious to have a more detailed formulation of what the real philosophical problem is here. What is unsatisfactory or incomplete about the account (or some modest expansion of it) that I've just given?

[Reply](#)

William 5 October 2011 at 03:36

What about the objection that the proof itself requires a proof and so on ad infinitum. Why is that objection not justified?

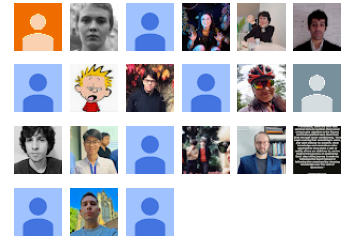
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David Corfield 5 October 2011 at 08:52

So, accepting Tim Gowers' description of mathematical practice as I do, perhaps there's a question as to why it was possible for the various branches of mathematics to reach the condition he describes. The advent of today's standards of rigour came piecemeal, some branches taking much longer than others. And you can see reactions to the perceived threat of losing the control that it affords in Jaffe

Typesetting math: 100% Quinn's concerns about the influx of research by physicists such as Edward

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That ultimately just about all of mathematics can be rendered in a single and, so far as we can tell, consistent system, ZFC, must tell us something. But the kinds of ways of knowing that there's something fishy in a proposed proof operate at a higher level than that. You can find out quite a lot about this intuition from the [Tricki](#). Category theory also provides a higher-level support.

Reply

Catarina 5 October 2011 at 14:35

I sometimes say that philosophy is about 'questioning the obvious'. So while the phenomenon of consensus in mathematics may appear to be fairly unproblematic, especially for those who experience it from within (i.e. professional mathematicians), if you think about mathematics as a body of human practices, I'd say it's quite astonishing. As Azzouni argues in the paper I link to above, in terms of institutionalized human practices, mathematics is quite unique in terms of its tendency towards consensus.

One can of course argue that this is a product of clear and precise standards, which are transmitted and perpetuated through education. But the comparison with other fields of scientific inquiry can be illuminating here. Take biology, for example: even though (almost) everybody agrees that evolution is the right framework, there is a lot of disagreement on the details: gradalism vs. non-gradalism, adaptationism vs. by-product accounts etc. It's not obvious in which ways education in biology would not be as conducive to consensus as education in math, and yet the situations seem very different.

And to say that we have a clear, rigorous notion of what a proof is is only the beginning of an answer anyway. As suggested above by David, the emergence of the current standards of what counts as a correct, rigorous proof was a long and winding process. Moreover, while these standards seem widely and unanimously endorsed on the level of practices, i.e. tacitly, a theoretical/philosophical account of what a mathematical proof is is still largely an open question. Typically, a mathematician can tell whether a given purported proof is a 'good proof' or not (as in the case discussed above), but she or he would be hard-pressed to offer a definition of what a mathematical proof is ("I know one when I see one.")

I realize that these questions may sound pedantic and unnecessary from the point of view of mathematical practice, but that's just philosophy, questioning the obvious...

Reply

Replies

Paul Ernest 10 January 2013 at 12:37

Catarina offers an interesting contrast between the achievement of consensus in mathematics and in empirical science, namely in biology and evolutionary theory. Education in biology and education in mathematics prepares both sets of researchers for speaking the same 'language', i.e., mastering the existing concepts and theories, and accepting the forms of argument, reasoning, experiment and proof in the respective discipline. However, at the last hurdle, in evaluating new alternative sub-theories, there are major differences in achieving consensus in the two fields. Why is this? Although there may be minor differences in educational style (mathematics assumes theory consensus, biology perhaps does not) is not the real difference in the disciplines themselves? Biology attempts to account for one world – the empirical world of living things we share. In other words, the truth test is fitting with this one world as best we can (subject to all the constraints indicated by Kuhn). Nevertheless, until theories are falsified or otherwise discarded they remain in contention. Mathematics develops theories based on ideas, concepts, assumptions, problems, etc., and ultimately there is no final competition between different theories. Provided they are consistent they may coexist. We have Euclidean and non-Euclidean geometries. There is no contradiction, no competition, no rivalry unless we apply them as applied theories to the empirical world. And then they are just another part of empirical science. The

latter strives for an intended model. Mathematical theories only need to satisfy some particular model, out of the infinitely many possible. So consensus is easier to achieve in mathematics than biology. Which is not to say that the process of proving is easier in mathematics than that of conducting empirical tests in biology. It is just that if your derivation is agreed to be correct there is no further final test of truth, irrespective of the epistemological grounds of that agreement.

Catarina 10 January 2013 at 13:02

True. But the puzzling thing is precisely this bit:

"It is just that if your derivation is agreed to be correct there is no further final test of truth, irrespective of the epistemological grounds of that agreement."

That is, the consensus on proofs/derivations being correct.

Reply

Terry 5 October 2011 at 18:22

As pointed out earlier, consensus in mathematics is a relatively recent phenomenon, basically dating back to the foundational work in the early 20th century. Before then, one had debates about use of infinitesimals, implicit use of the axiom of choice (before this axiom was explicitly formulated), use of complex analytic methods instead of "elementary" methods, etc.

In my view, one of the main reasons we were able to build such solid foundations to mathematics was that mathematics had been maturing for over 2000 years as a cumulatively developing subject, and that by the early 20th century we had finally reached the point where we could build proper foundations. There are other disciplines that are as old as mathematics (philosophy, for instance), but the cumulative development process started later. (Mathematics, for instance, still uses the classical theorems of Greek geometry, but much of Aristotlean physics or metaphysics has now been discarded by their modern counterparts.) Physics, for instance, has been developing more or less cumulatively since Galileo, and it is conceivable that in a century or two they may have a consensus foundation that is as solid as the foundations of mathematics are today. (They're not quite there yet, though.)

So perhaps the deeper question is why mathematics started developing in a cumulative fashion much earlier than most other disciplines.

Reply

david chalmers 5 October 2011 at 21:21

here's a draft mini-paper on [convergence in philosophy](#) and why there isn't more of it, by comparison to mathematics, physics, and so on. there's also some [data](#) here. of course the foundations of mathematics is intermediate between regular mathematics and philosophy in some respects, so it's not surprising that convergence on the foundations of mathematics is slower than convergence on regular mathematics and faster than convergence in philosophy. it would be nice to pin down the relevant dimensions of difference.

Reply

David Corfield 6 October 2011 at 09:45

It's important to recognise that advances in mathematics are largely brought about by conceptual innovation rather than by grounding in some or other foundational language. Nineteenth century projective geometry texts may need a little tightening up in terms of rigour from our perspective, but far more importantly we don't need to stand in such awe of the fact that theorems and their proofs can be dualised by the simple expedient of exchanging a few terms, 'line' and 'point', 'passes through' and 'lies on', etc., once we understand the role of the outer automorphism of the group $SL(3, R)$. To understand this we need to understand a

I could go on and on here. It was a conceptual necessity for Poincaré to introduce early methods of algebraic topology in the 1890s. In doing so he shone a light on earlier work and transformed the mathematics of the twentieth century.

This isn't to underplay the importance of foundational work, but innovations in the axiomatic method have been as important for allowing conceptual clarification and advance as for the provision of security. How mathematics affords the opportunity for radical changes in its conceptual outlook while preserving a tightly integrated network of theories is the interesting question for me.

Reply

Catarina 6 October 2011 at 14:54

Good points, @Terry. They clearly illustrate my conviction that the philosophical discussion of these issues must be thoroughly historically-informed if it is to go anywhere.

I would just like to clarify on what level I identify a tendency for overwhelming consensus in mathematics: it is mostly on the level of recognizing a given proof as correct or incorrect. Of course one can disagree on whether certain assumptions used along the proof are legitimate or not (e.g. the axiom of choice or what have you), but granting the assumptions, in most cases there seems to be consensus as to whether a proof is correct or not. As suggested by David Chalmers above, it is not so surprising that there should be more divergence of opinions in discussions on the foundations of mathematics, where certain assumptions may be questioned or accepted on grounds other than proofs, than in what he calls 'regular mathematics'.

Reply

Valeria 7 October 2011 at 02:14

Well, I think the consensus amongst mathematicians is what we created mathematics for. Most mathematicians I know have this craving for irrefutable arguments, for always wanting to dispute what has been said by others until no doubt remains (lovely put in cartoon form here <http://abstrusegoose.com/353>), so in some ways is really not surprising that the consensus is there. Sure, it relies on the cumulative nature of the subject. In fact, what is disturbing is when it is *not* there, as is the case of foundations, of the debate between constructive vs classical logic. The need for certainty has turned many mathematicians into constructivists, it seems to me...

Reply

John Baez 7 October 2011 at 03:49

William wrote:

"What about the objection that the proof itself requires a proof and so on ad infinitum. Why is that objection not justified?"

No mathematicians believe that objection, so even if it were true, it wouldn't affect the way they arrive at a consensus. I.e., we hardly ever mathematicians object to someone's proof claiming the proof needs a proof... although I can imagine someone demanding program verification for a computer-based proof of the 4-color theorem.

Reply

John Baez 7 October 2011 at 03:50

"hardly ever" -> "hardly ever see"

Reply

John Baez 7 October 2011 at 04:01

I think Valeria hit the nail on the head: mathematicians crave consensus.

If any sort of argument is of the sort that it only convinces 50% of mathematicians, we'll either say it's "not mathematics", or discuss, polish and/or demolish the argument until convinces either 99% of mathematicians or just 1%. (Example: Cantor's proofs.)

If someone doesn't play the game according to the usual rules, we'll make up a new game and say they're playing that game instead, thus eliminating potential controversy. (Example: intuitionistic mathematics.)

Finally, we reward people who quickly admit their errors, instead of fighting on endlessly. We say they're smart, not wimps. (Example: Edward Nelson.) People who fight on endlessly are labelled crackpots and excluded from the community. (Examples: too numerous to list here.)

Reply

David Corfield 7 October 2011 at 08:50

Well yes, mathematicians crave consensus, but then so do a lot of people. I crave consensus in philosophy (especially if it converges on my views), but I don't expect to find it. The question is why are mathematicians able to satisfy that craving. How have they been able to develop robustly stable practices? How is it possible to sense problems in a proof without dipping down to the machine code of its fully formal rendition.

It would be fascinating to have a transcript of the thought processes which allowed Terry Tao to see the problem with Nelson's proof.

Reply

Catarina 7 October 2011 at 10:54

Great points, @david! I agree entirely.

Reply

Terry 7 October 2011 at 19:19

Dear David,

Actually, Nelson's proof was relatively easy to understand, in part because he took the trouble to write out a short outline which make clear the general strategy of proof while omitting most of the technical details (though it was ambiguous at one very crucial juncture), and also because I had already previously thought about the surprise examination (or unexpected hanging) paradox and the Kritchman-Raz argument (see the last section of <http://terrytao.wordpress.com/2011/05/19/epistemic-logic-temporal-epistemic-logic-and-the-blue-eyed-islander-puzzle-lower-bound/>).

From the outline one could already see that the main idea was to adapt the Kritchman-Raz argument to the theory Q_0^* , which "almost" proved its own consistency in that it contained a hierarchy of theories Q_1, Q_2, Q_3, \dots , each of which could prove the consistency of its predecessor.

Now, I did not at the time fully understand the definition of Q_0^* , nor was I fully aware of the Hilbert-Ackermann result which guaranteed this chain of consistency results, but I was willing to accept the existence of such a hierarchy of theories. (I've since read up a bit on these topics, though.) The question was then, given such an abstract hierarchy, whether one could use the arguments of Chaitin and Kritchman-Raz to establish the inconsistency of at least one of these theories.

These arguments were simple enough (they were basically formalisations of the Berry paradox and surprise examination paradox respectively) that I could then try to do that directly, without any further assistance from the outline. And, indeed, when I attempted to do this, I did at first seem to obtain a contradiction (much as paradoxes such as the Berry or surprise examination paradoxes also lead to absurdity if one reasons somewhat carelessly using informal naive argument). So I

Typesetting math: 100%]d see where Nelson was coming from; but then I spent some time trying to

expand out my arguments in detail to find the error. The key, as I found out, was to specify exactly what proof verifier would be used for the Chaitin portion of the argument (this was an issue that was left ambiguous in Nelson's outline), and in particular whether it would accept proofs of unbounded complexity or not. Since Nelson wanted to keep all proofs at bounded complexity, I used a proof verifier that enforced such a bound, and eventually worked out that this could not be done while keeping the length of the Chaitin machine constant; this was the objection that I raised in my first few comments. However, after Nelson responded, it became clear that he was using an unrestricted proof verifier, and this led to a different problem, namely that the proofs produced by Chaitin's argument were of unbounded complexity. So there was not a single "flaw" in the argument, but rather there were two separate flaws, one of which was relevant to one interpretation of the argument, and the other of which was relevant to an alternate interpretation of the argument.

Aside from this one ambiguity, though, the outline was quite clear. Certainly there have been other manuscripts claiming major results that were much more difficult to adjudicate because they were written so badly that there were multiple ambiguities or inaccuracies in the exposition, and any high-level perspective on the argument was obscured.

Reply

David Corfield 8 October 2011 at 16:28

Dear Terry, thanks very much for that. For me it's intriguing how high-level perspectives, phrased in a natural mathematical language, can be sufficiently clear that they allow for the requisite checks to be made. I wonder if in the passage you describe in the second half of the penultimate paragraph, your reasoning is assisted by familiarity with similar potential problems, perhaps arising in very different parts of mathematics.

In my book I discuss the claims that automated 'analogical' reasoning allowed the production of a proof of Heine-Borel in two dimensions, from a proof of the one-dimensional case. My point was that even in this simple case, the program, which is operating syntactically, requires a large amount of human assistance.

Put in 'ordinary' language, one would suppose a closed interval with a cover and no finite subcover. Then take half of the interval which can't be finitely covered. Iterate this process. There is a point in the intersection of these nested intervals. It must belong to an element of the cover, and far enough along the sequence the nested intervals must be contained inside that element. Contradiction.

The one worry for the human trying to extend this to two dimensions is to make sure that one can go far enough along the sequence so that each dimension of the nested rectangles fits inside the given element of the cover. The computer needs a big hand just here.

Now some truly analogical reasoning would come into play if the human recognises from similar experience that an attempt to work an infinite-dimensional variant of the proof will not work as we cannot be assured that there's an upper bound to distances along the sequence for each of the dimensions to become small enough.

Would I be right in thinking that

Reply

windwheel 7 January 2013 at 10:08

In this specific case, all the mathematicians involved relied for their work on a specific highly developed theory- let me call it a module- and none was prepared to bear the cognitive cost of re-writing the entire module which is why there could be a quick resolution. Surely this happens all the time in other disciplines as well? Indeed the less 'rational' or alethic the subject area the lower the cognitive pay-off for rewriting entire modules so we might find even faster resolution, without even the pause for critical thought. A lesser mind might have taken much longer to concede the point.

Still, suppose there was a big cognitive pay-off, currently available, for entirely rewriting the Chaitin theorem 'module' or rethinking Kolmogorov complexity- it may be that some or other of those involved might have taken that tack.

Surely an 'in-built opponent' is a feature of all social communication? It weighs down most heavily where the cognitive cost of re-writing modules are high or the reward is miniscule? I suppose statements about fashion or syntax or what is considered politically correct, have this feature and thus in most social sub-sets there is going to be very quick recantation simply because the cost greatly outweighs any possible benefit.

At this point, I'd like to introduce a notion of ontological dysphoria- the feeling of being in the wrong Universe, the intuition that the Cartesian duality of mind and body points to something more troubling, bizarre or tragic. It may be that there is a sort of genotypal canalisation towards a widespread feeling of this sort- perhaps, rather than a malaise attributable to the *welgeist*, ontological dysphoria is the driver for the necessary-but-not-too-much preference diversity needed to drive trade, but also communication and the elaboration of Knowledge systems.

It may make a sort of collocational sense for us to agree that Math represents a limit case of one sort and philosophy, with its distinctions without differences, as the limit case of its opposite.

Gödel and Von Neumann, both Theists on their death beds, who agreed on so much in the way of mathematics yet had ontological dysphorias of opposite tropism. It may be that the latter type of 'madness'- or stark solipsistic discontinuity- is as important a driver for breakthroughs in Maths as the great powers of 'reason' both possessed which enabled the Von Neumann to grasp Gödel's result, perhaps, more thoroughly and more quickly than he had done himself.

Reply

Tony Mechelynck 17 December 2015 at 07:05

(On rereading this post it seems overly long and maybe boring, especially in its central part "about mathematics". Let's hope someone will be interested. If you aren't, O reader, it's probably my fault rather than yours.)

As a mathematician, but at a rather low level (retired teacher to junior high school, i.e. pupils 12 to 15 years of age), I believe that the ready obtainability of consensus is a defining characteristic of mathematics:

Truth in the experimental sciences is defined by agreement with reality, and is always provisional, and subject to the precision of experimental measures.

Truth in mathematics is defined by internal consistency, and the proof of a really fundamental contradiction (as in the "naïve" axiomatization of set theory, when it was shown that, obviously, "the set of all sets which are not members of themselves" is a member of itself if and only if it isn't) is cause for a serious overhaul of the theory in question (with ZF set theory and its family, but IUC also with other axiomatizations, all making it so that it is not meaningful to talk about a "set of all sets which are not members of themselves". The solution I'm familiar with is Bourbaki's, who defines the notion of "collectivizability" ("nous disons qu'une relation R est collectivisante en une lettre x si $(\tau[x](R)|x)R$ est un théorème (Définition de "collectivisante"). De cette définition il découle immédiatement que la relation $x \notin x$ n'est pas collectivisante en x .) (Sorry, my mother language is French and I'm not sure I can provide an exactly faithful translation into mathematicians' English.) Another reformulation (IUC what is vaguely mentioned about it in Hofstadter's /Gödel, Escher, Bach: an Eternal Golden Braid/) is the theory of types.

As such, "truth" in mathematics is only relative to a certain choice of axioms: within a given theory (defined by its set of axioms), and if I accept Bourbaki's meaning of "true", then as long as the theory is consistent (which is not always easily provable) there are "true statements" (theorems), "false statements" (whose negation is a theorem), and usually "undecidable statements" (which are neither a theorem nor the contrapositive of a theorem). Of course, if the theory is inconsistent,

then everything it is both true and false and _this particular choice of axioms_ loses all interest. Usually, however, for any theory which really interests mathematicians, and always AFAIK for any mathematical theory which interests physicists, engineers, etc., it is possible (not always easily) to find a reformulation of the set of axioms in a way which both avoids the inconsistency just discovered and preserves the already much-used results of the theory.

Gödel's undecidability theorems establish the surprising (for his time) result that in any theory "powerful enough to develop number theory in it" there is at least one undecidable statement, and therefore an infinity.

I might be tempted to say that philosophy is characterized by the fact that it is amenable neither to proof by experimentation nor to proof by consistency, and that yet (unlike most variants of theology) it is also not accessible to the argument of authority (i.e. the proof by "Ipse dixit" as the Latins said, or equivalently by "Αυτος εφη" as the Greeks said). But I'm not enough of a philosopher to be sure that this paragraph about the nature of philosophy is valid. (Every mathematician has, of course, to be /some/ of a philosopher, if only to discuss metamathematics and metalogics; but that isn't much as philosophers go.)

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Allen jeley 17 January 2016 at 00:10

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Nionica 2 December 2019 at 07:18

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John Miller 4 December 2019 at 12:39

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James Wright 10 December 2019 at 06:32

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rickypalm 24 December 2019 at 06:08

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thomas brick 24 December 2019 at 09:58

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James Marcus 26 December 2019 at 14:55

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Microsoft Outlook Office 3 January 2020 at 10:20

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harryparker0123 6 January 2020 at 06:03

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ana 11 January 2020 at 14:12

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lajwantidevi 13 January 2020 at 05:19

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ana 21 January 2020 at 11:51

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James Ian 28 January 2020 at 12:25

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assignmentauthors 6 February 2020 at 11:58

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tom554 11 March 2020 at 05:47

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Unknown 19 March 2020 at 08:23

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Chris Evans 23 April 2020 at 06:47

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noahhill 24 April 2020 at 13:48

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Tuckerjackk 27 April 2020 at 11:10

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hpprintercare 28 April 2020 at 11:41

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Reply

HP Printer Troubleshooting 29 April 2020 at 06:40

All HP printers are very reliable and offer great performance during printing and scanning. Sometimes users face HP Printer Error 79 due to outdated printer firmware or corrupted print job. If you have error 79 with your printer then get help from experts to fix it.

Reply

Sofia Margerate 29 April 2020 at 12:06

Hi

Reply

Kazima Perfumers 30 April 2020 at 10:45

Very Nice and Great post. I am glad to see people are still interested of this blog. Thank you for an interesting read more....[Private Label Cosmetics Suppliers in India](#).

Reply

Anonymous 30 April 2020 at 17:00

online assignment help in Australia that ensures that you meet the deadline every time. It is important that the assignments are written in a way that all the questions asked by your professor are answered and all the objectives are fulfilled. Our subject experts make sure that we do not deviate from the actual context of the assignment and provide the best possible solution without charging an exorbitant amount. Our fair pricing and discounts make our services even more accessible and the best choice when availing the online assignment help in Australia. We consider it a sign of discipline to meet the deadline and submit top quality work within the designated time limit. The subject experts at assignment work help deliver the required output to meet the expectations of our clients every time and make sure that you get good marks for every assignment.

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Reply

Runi 1 May 2020 at 07:04

Thank you for your outstanding article. I will be your regular visitor. Are you experiencing difficulty in writing business analytics? Well, you don't have to experience sleepless nights because of business analytics assignments. At our Business Management Assignment Help Service, we have experienced business analytics writers who can provide you with the much-needed help in writing your assignments. Visit [Business Analytics Assignment Help](#). for more

[Reply](#)

My Assignment Help Online 1 May 2020 at 12:51

I recommend to visit my assignment help online website to get our **assignment help Sydney** service for all your academic tasks. Our website will help you in your studies and if you are thinking to improve your skills, we can help you in that as well. Without thinking much hire our service now!

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jennifer 1 May 2020 at 18:42

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jennifer 1 May 2020 at 18:42

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Sam Smith 4 May 2020 at 12:29

Hello there, great stuff you've shared here I will be checking regularly for more articles. But wait! When it becomes hard to manage your online assignment, availing Online Assignment Help is the best choice. Many students often fail to submit their assignment before deadlines and end up scoring low grades because they didn't have enough time to write the assignment given on time and satisfactorily. Visit [Assignment Help](#) . for assistance.

[Reply](#)

Nino Nurmadi , S.Kom 5 May 2020 at 15:11

Keutamaan DoaNino Nurmadi, S.KomYaasin Cara Shalat Nabi Muhammad Kencing Malaikat Nino Nurmadi, S.Kom Nino Nurmadi, S.Kom KhalifahTayamum

[Reply](#)

Chris Evans 12 May 2020 at 08:19

When I try to login into my Hotmail email account, I am failing to login into hotmail email account. I am facing [Hotmail email login](#) problems, so I am unable to access my Hotmail account. I don't have complete technical skills to resolve this login issue. So anyone can suggest the appropriate ways to resolve Hotmail email login error.

mariahayden 20 May 2020 at 08:06

How to Troubleshoot Gmail temporary error numeric code 7?

Gmail error codes are usually temporary in nature; however, some users do find them tough to resolve it. Among many errors related to Gmail, the **Gmail temporary error numeric code 7** is the typical one. In case, if you are facing such a numeric error code, no worries, you can get in touch with Gmail executives straight away.

Reply

vin78987 23 May 2020 at 13:19

'Why Does My Printer Say Offline' is one of the most asked queries. The printer goes offline owing to multiple reasons. If you have the same question, why does my printer say offline, then you first need to find the root cause of the problem.

Reply

Jendralpoker Education 24 May 2020 at 23:13

Jendral poker adalah agen judi yang terpercaya di server PKV dengan persentase kemenangan yang tinggi.

Whatsapp: +855 8731 8883

Reply

Assignment Achievers 25 May 2020 at 15:13

I'm highly impressed by the piece of thoughts you have shared on this portal. all the best

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Reply

Yulia Hasyanti 26 May 2020 at 04:11

Mkvpoker Adalah Situs Judi Poker Terbaik Dengan Taruhan Uang Asli Yang Menjaminakan Kemenangan Yang Tinggi

Hub WA : +855 9637 31855

Reply

Yulia Hasyanti 26 May 2020 at 04:12

Mkvpoker Adalah Situs Judi Poker Terbaik Dengan Taruhan Uang Asli Yang Menjaminakan Kemenangan Yang Tinggi

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Reply

Microsoft Outlook Office 26 May 2020 at 06:36

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Microsoft Outlook Office 26 May 2020 at 06:43

We recently did work on Hotmail. We have [Change Hotmail Password](#) after that, assess Hotmail is very easy for work for everyone. With our client request, we are worked on it and finally, we got success to [hotmail change password](#).

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Assignment Help 26 May 2020 at 07:01

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Anya 26 May 2020 at 14:53

Looking for the latest Bollywood celebrity news? It's not easy to find but there are tons of ways to find this. The first thing you need to do is to search the Internet for the celebrities that are in your area, people who are related to your country, and individuals in that area are the best ones to search since they have the most up to date information. Then you can put the name in a search and get the results from Google or Yahoo. Once you find the name you like you can get the most updated news articles from websites where you can also get the latest Bollywood gossip today. In general the most accurate way to keep up with Bollywood news is through social networking sites. Some websites allow you to upload the news article you want, and others allow you to add comments on them. This is the easiest way for finding the latest Bollywood celebrity news and updates. You can also find the celebrity news and latest bollywood gossip today on your favorite site at [Bankofbollywood](#). [latest bollywood celebrity news](#) | [latest bollywood gossip today](#) | [today's bollywood gossips](#) | [latest entertainment news today](#) | [today's entertainment news headlines in english](#) | [political breaking news](#) | [latest business news headlines](#)

[Reply](#)

AOL DESKTOP GOLD DOWNLOAD 26 May 2020 at 15:55

If you are unable to find the solution to resolve [Yahoo mail problems](#) not receiving emails then you can contact the experts to get the solution. When none of the options helped you as mentioned above, then taking help from Yahoo technicians can resolve the issue in just a few minutes.

[Reply](#)

Jenifer 27 May 2020 at 06:51

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asdasd 28 May 2020 at 01:41

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Reply

Yulia Hasyanti 28 May 2020 at 02:47

Mkvpoker Adalah Situs Judi Poker Terbaik Dengan Taruhan Uang Asli Yang Menjaminakan Kemenangan Yang Tinggi
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Kunjungi Situs Kami Di : Mkv poker.pw

Reply

yulia hasyanti 28 May 2020 at 02:49

Mkvpoker Adalah Situs Judi Poker Terbaik Dengan Taruhan Uang Asli Yang Menjaminakan Kemenangan Yang Tinggi
Hub WA : +855 9637 31855

Reply

James Ian 28 May 2020 at 09:25

What a wonderful piece of article I have bookmarked for future checkup. A capstone paper is normally a lengthy academic document that demonstrates a student's ability to conduct independent research and to communicate the findings or the results in an academic manner. This type of academic paper follows a conventional format and it is normally written by students during their final year of pursuing a given programme. Learn more on [Capstone Project Writers](#) .

Reply

James Wick 28 May 2020 at 10:18

Use [Java Programming Help](#) if you have less knowledge of coding and programming language. If you find tough to compose your Java papers before the due dates, get expert's help using the option of online Java programming services. [Java Assignment Help](#)

Reply

technical help 29 May 2020 at 10:17

Secret word is the way in to your messages and on the off chance that they get taken, lost or traded off it be exceptionally extreme for you to recover it. It is constantly proposed to change your secret phrase as often as possible to limit the hazard. In the event that you are an AOL email client and you wish to [change aol password](#) word on your apple gadgets at that point basically follow the underneath referenced advances and complete it without anyone else.

Reply

petersidle 29 May 2020 at 13:02

[Moxie Pest Control](#) is one of the best company, and one of the reason is the safe methods of treatment that they use. To try, call them now.

Reply

James Wick 29 May 2020 at 14:43

To get the correct of **How many pages is 1000 words**, keep the essential pointers in your mind. For experts' answer on this question, use assignment help services and connect with professionals.

1000 words to pages

1000 words is how many pages

Reply

Experts Helpline 31 May 2020 at 11:35

According to a Pest's related survey, over 67% of American homeowners experience pest problems and about 22% of them face some structural damage caused by pests. The best way to stop the continuous attack of these little creatures is professional pest control treatment. However, only a good and certified company can provide you best and long-lasting results, such as **Clarks Pest Control CA**. Clarks Pest Control CA offers a range of offers a variety of services and solutions to its customers to fight with pests situations. The company serves residents and businesses.

Reply

James Wick 1 June 2020 at 04:17

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asdasd 2 June 2020 at 02:39

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Reply

TWC Email Not Working Error 3 June 2020 at 12:10

It's truly a nice and helpful piece of info. I am satisfied that you just shared this helpful info with us. Please stay us up to date like this. Thank you for sharing.

Reply

mark777 5 June 2020 at 12:42

Microsoft Office installation is essential tool for any PC inside this generation. It provides quite useful tools such as MS-Word, Excel and PowerPoint that are crucial for creating your task quite easy associated with company. This attribute makes Office.com/setup one of the greatest software bundle.

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Reply

Epson Printer Error Code 031008 9 June 2020 at 15:45

Very Interesting! Some very valid points! I appreciate you writing this post and also the rest of the blog is really good.

Reply

Outdoor Advertising Agencies in Delhi NCR 10 June 2020 at 04:12

Hoardings in Delhi NCR, Outdoor Advertising Agency in Delhi NCR, Outdoor Hoarding Advertising Service in Delhi NCR is the best way to promote your business as those who handle to get the target audience's maximum exposure. Outdoor billboard advertising in Delhi NCR definitely has an advantage over other means as it is a cost-effective way of capturing the attention of a potential customer to the products or services.

we are popular in providing a broad Outdoor Hoarding collection which is used

for advertising purposes in Delhi NCR. These stands are assembled according to specified industry standards using high-grade raw material and cutting-edge technology. These stands are available in various technical configurations and can also be customized to suit the varied needs of the customers.

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James Ian 13 June 2020 at 07:13

What a great piece of content giving a good insight on topic at hand, Need more support for your lower back? Interested in something cushy to put your feet on? Comfortable pillows made for lumbar support are perfect for these situations. Besides comfort, a pillow allows you to express your style. Read more on [Throw Pillow Covers](#)

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Olivia 16 June 2020 at 18:23

Your appearance is a reflection of your personality try these cool boho dresses and accessories @ bohemian land to shine
topic

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Olivia 16 June 2020 at 18:26

give a brand new look to your car by customized car accessories and toys @ auto x tools
pillows

[Reply](#)

Assignment help 18 June 2020 at 10:41

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Assignment help 18 June 2020 at 10:42

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[Reply](#)

Delete Budget in QuickBooks Desktop 19 June 2020 at 08:55

Nice information. Thanks for sharing content and such nice information for me. I hope you will share some more content about. Please keep sharing!

[Reply](#)

Alum Altun 20 June 2020 at 19:09

Thanks for sharing it is important for me. I also searched for that from here. Visit our site [Trend Micro nummer belgie](#)

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ELTS band score calculator

converts total number of correct answers into approximate IELTS band score. The correct answers ranging from 0 to 40 and band scores from 0 to 9. It simply gives you an idea about your band score in the IELTS exam by taking practice tests at Gratis Academy. The approximate or raw test scores required to get a particular band score in Listening and Reading tests vary slightly in General and Academic exam modules. Each module is rated by Cambridge for a particular level of difficulty which determines the requirements of your raw scores.

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Reply

jemas join 24 June 2020 at 12:59

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Reply

John Matt 24 June 2020 at 18:16

This is an awesome motivating article. I am practically happy about your great work. Keep writing. Continue blogging.

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Used Auto Body Parts Near Me
Used Body Parts For Cars

Reply

John Matt 24 June 2020 at 18:20

Your blog is really awesome. All information are very useful for me. Thanks for providing me this information.

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Reply

James Martin 25 June 2020 at 09:38

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skills and writing attributes using experts' assistance by placing your order online in Ireland.

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Maira Smith 26 June 2020 at 07:52

While using AOL sometimes people used to error messages while AOL login, if you are having the same problem then you can visit us to know more about how to eradicate **Aol error message** while using AOL services.

[Reply](#)

Manage office 26 June 2020 at 11:01

To use outlook on your iPhone one must install the office 365 setup on their iPhones to use outlook. To know more about this feel free to visit us at **How to setup office 365 email on iPhone.**

[Reply](#)

Unknown 26 June 2020 at 12:43

While working on a computer sometimes one has the need to get the screenshot of the current window to get the screenshot one must know about **How to screenshot on HP laptop.** If you also want to know about how to take a screenshot then you must follow the link mentioned here.

[Reply](#)

Unknown 26 June 2020 at 12:54

Sometimes while using a Laptop the touch screen of the laptop might stop working. If you are also having the same issue with your laptop why wait just visit fix **hp laptop touch screen not working.**

[Reply](#)

cash_app_failed 29 June 2020 at 16:23

Your post is very nice. I will use this information for me also share with others. Thanks for sharing this post.

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cash_app_failed 29 June 2020 at 16:29

Cash App provides a better and simple way for transfer money online. Sometime new user stuck Cash App Online Login. If you are also facing this issue. Please connect with Cashapp Login for more information. Our team of technician and expert help you to **How to Sign into Cash App.**

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Cash App Online Login

Login into Cash App

Login Cash App

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Reply

cash_app_failed 29 June 2020 at 16:35

Great Article with great information. Thanks for sharing this!!!! If you stuck with Transfer Paypal to Cash App Problem then pay an attention on these links.

Send Money from Paypal to Cash App

How to Send Money From paypal to cash app

Can you send money from paypal to cash app

Can I send money from paypal to cash app

Can I transfer money from paypal to cash app

How to transfer money from paypal to cash app

Can i send paypal to cash app

Send money to cash app from paypal

How to transfer paypal to cash app

Transfer money from paypal to cash app

Reply

cash_app_failed 29 June 2020 at 16:45

Great post!!!! I will defiantly use this information in my future and share with my friends and colleagues. Thanks for sharing this post. If you have any problem related with Cash App transfer failed then visit these links.

Cash App Transfer Failed

Cash App Payment Failed

Cash App Failed for My Protection

Cash App Canceled for your Protection

Cash App this Transfer Failed

Cashapp Payment Failed

Transfer Failed Cash App

Cash App Payment Failed for My Protection

Thank You

Reply

Anonymous 1 July 2020 at 11:54

I admire your art of writing. Physical therapy is a specialty in the field of health care, which utilizes exercises, massage, heat treatment, and such physical methods to treat an injury, deformity, or a disease instead of using surgery or drugs. If you are interested in studying such interventions, then you should pursue physical therapy studies in an institution of higher learning. Read more on [Physical Therapy Capstone Writers](#)

Talley Patricia 2 July 2020 at 12:23

Thank you so much for sharing these amazing tips. I must say you are an incredible writer, I love the way that you describe the things. Please keep sharing

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Talley Patricia 2 July 2020 at 12:25

This is an awesome motivating article. I am practically happy about your great work. Keep writing. Continue blogging.

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Talley Patricia 2 July 2020 at 12:28

Your blog is really awesome. All information are very useful for me. Thanks for providing me this information.

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Blaze Hotels 6 July 2020 at 18:33

Very Nice and Great Blog post!! Blaze Hotels best quality and service provider in India. read more information....[Hotel management services](#)

[Reply](#)

Help Assignment online 9 July 2020 at 16:52

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[Reply](#)

Harry Clark 17 July 2020 at 06:17

Google Meet and Zoom are the two popular video conferencing platforms that enable you to conduct meetings with a good number of participants at the same time.

Google Meet or Zoom

Reply

Install AOL Desktop Gold 18 July 2020 at 08:02

Awesome post I must say and thanks for the information. Thanks again for providing us these unique guidelines it's actually helpful for each person. I appreciate your post and look forward to more.

Reply

kakai 20 July 2020 at 00:35

If you are looking for a phone number to contact cash app support center, the you have landed on the right page. In the article below, we will tell you about Cash App and how to get support services for your accounts

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Reply

Joy Cobb 3 August 2020 at 03:07

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The process was smooth and simple .There was no problem in communication and i guess it was reliable and i got good results

Reply

James Ian 3 August 2020 at 10:57

What an informative article. Tell you what I have bookmarked your website for regular checkup. Thank you for taking time to share such a great content. Are you puzzling about who to contact for Nursing Writing Services? Could it be that you are working on a tight budget yet need high-quality nursing-related assignments? Is it the efficiency that you are looking for? Well, with the popularity that the nursing course has gained over the years, there are a lot of gaps to fill in the health sector. Read more on [Nursing Essay Writing Services](#).

Reply

Joy Cobb 3 August 2020 at 11:39

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<https://www.myassignmenthelp.net/it/data-analytics>

i can't even imagine how they are doing that's incredible they are the god that helping the students who are stuck in job and study.

Reply

James Robin 9 August 2020 at 13:33

idm crack is also possible by this software to create and schedule several download queues for perfect synchronization. Furthermore, it also sets a time for interruption between different downloads as well. The comprehensive error recovery of the software resumes the files due to a network failure or any other problem. It automatically fixes the issues of any download. Besides, you can easily continue to complete your works at a faster speed as well. The demanding tools of the software support all popular browsers too. In addition, the IDM engine supports Internet Explorer, Firefox, Chrome, Opera, and many more.

Reply

Edward Lewis 10 August 2020 at 10:27

Visit mcafee.com/activate to successfully download, install, and activate your McAfee product. Get all-round protection from McAfee Activate. Get real-time protection with McAfee by finding ?steps to download, install, and activate McAfee antivirus setup. To get McAfee security, visit mcafee.com/activate

webroot.com/safe- Get effective web-security on your system with Webroot SecureAnywhere. Easily download, install, and activate the software on webroot.com/safe. Webroot Safe: Avail world-class web-security on your computer with Webroot. Quickly download, install, and activate the product by visiting webroot.com/safe

Reply

Edward Lewis 10 August 2020 at 10:28

mcafee.com/activate - Completely secure your device with McAfee. Download, install, and activate McAfee at mcafee.com/activate. Download and Activate your McAfee product via mcafee.com/activate. If you are facing any issues refer to mcafee.com/activate

webroot.com/safe : Enter your 25-digit activation key and redeem your Webroot subscription. Visit webroot.com/geeksquad to install Webroot setup on your device.

Reply

Edward Lewis 10 August 2020 at 10:28

norton.com/setup
mcafee.com/activate
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Reply

Sofi Mariam 11 August 2020 at 11:33

If you want to set up your preferred model of HP printer, you can use **123.hp/setup**. This website helps you to set up HP printer easily and quickly. If you are facing problems in using this error or completing the setup process of HP printer, you can take the specialized help from live technical professionals. You need to open this website in the web browser and enter the model number of your printing machine. After completing this step, you should go for next step to complete. If you are getting stuck in the setup process of HP printer using you can take full and specialized help from live technical experts.

Reply

lucyzara 25 August 2020 at 05:25

For Australian **Assignment Help** services, browse the website of the service provider, and access all important information. Make sure to extract all essential information on academic writing services before placing your order for online academic writing services in Australia.

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Reply

stellabrown 25 August 2020 at 13:47

Hi, I am stella brown I am reading your blog, It is amazing blog thanks for the sharing the blog. Allassignmentservices.com provide the **Ecology Assignment Help** such as a information about education for students queries. allassignmentservices also provide the **Best assignment writing help**. Students from different walks of life

can afford our assignment help services as we are affordable. Moreover, our team of academic writers is highly efficient at their work.

[Reply](#)

Jessica Jones 28 August 2020 at 15:35

This is a really so wonderful article and great read for every user. It's my third time visit to your content blog, and I have found it so marvelous and informative especially this article. Thank you so much for this release. [hnd assignment help - economics assignment help - programming assignment help](#)

[Reply](#)

Kelly Cain 28 August 2020 at 20:47

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[Reply](#)

technical help 29 August 2020 at 05:17

[suddenlink email login](#) is an astonishing email support service, you can ever get. We use the expertise of our strong support team to resolve any and all issues that may arise during the use of [suddenlink login](#). Suddenlink customer service team will help our helpline number +1-844-414-5222 you to get the best out of this email service.

[Reply](#)

Jessica Jones 31 August 2020 at 16:48

I found all the information mentioned really priceless and justifying the topic of the article release. Much thanks for sharing and We all Appreciate your sharing this best posting. Bye and good night. [assignment help in australia - Assignment Help Melbourne - Assignment Help Perth](#)

[Reply](#)

Daily Tactics Guru 2 September 2020 at 17:54

Daily Tactics Guru is one of the fast-growing blogging platforms, where you will get opinions and information regarding various significant aspects of the progressive world. [Daily Tactics Guru](#) accepts all niche content like Business, Current affairs, Economy, Lifestyle Food, technology as well.

[Reply](#)

remmy 4 September 2020 at 15:20

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[Reply](#)

siomamarry 4 September 2020 at 16:29

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Reply

sigmamarry 4 September 2020 at 16:45

Hey there. I found your blog by the use of Google while looking for a comparable subject, your site got here up.It appears to be good. Amazing article written. I usually don't read such articles but your article is just too good.

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Reply

sigmamarry 4 September 2020 at 16:52

According to concept of well wrighting yor blog is very nice.. usefull with great information..good job keep it up...

office.com/setup | www.office.com/setup | [office setup](#)

Reply

Sam Smith 12 September 2020 at 08:37

Your article is attractive and informative. Nursing Care Plan Writing Services is a platform that offers high quality and competent services. All our writers have a nursing background which helps to ensure quality. Different writers have specialized in different nursing areas. Our team will, therefore, work nursing care plans for patients with different diagnoses to perfection. They then provide you with the intervention measures to use in the patient care procedure. Learn more from Nursing Care Plan Writing Services.

Reply

kakai 14 September 2020 at 18:41

Hi I m Harry Thomas working with Cash App Help. We work towards making the customer experience of making payments through Cash App simple and easier. Contact us for any type of query.

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Reply

jack smith 19 September 2020 at 06:23

canon.com/ijsetup offers the Printer Setup download link where you can install the printer setup further. office.com/setup gives multiple options to activate and register setup for everything you work on office products. Visit roku.com/link & roku.com/link/activation and enter the link code shown on your display to connect Roku with your account and device as well. The 123.hp.com/setup is actually a site which is set up by HP technicians to help people set up their HP Printer.

Reply

jack smith 19 September 2020 at 06:25

Twitch TV has been the greatest and the most famous video streaming platform for every gamer on this planet

twitch.tv/activate .

The hp.com/123 is actually a website which is set up by HP technicians to help people set up their HP Printer. Go to mcafee.com/activate and register your subscribed McAfee product such as McAfee total protection or McAfee Internet Security. Use the 6 digit amazon mytv code displayed on your smart tv screen at Amazon.com/mytv .

Reply

Bigg Boss 14 19 September 2020 at 15:16

Bigg Boss 14 - Watch Online Episode Colors Tv Show Full Videos in HD

Reply

Jessy Jason 21 September 2020 at 07:47

Jessy this side, if you are doing regular [windstream email login](#), you surely face some technical login issues and you need online Windstream tech support. So, instead of wandering casually, simply put a call at 844-300-0168.

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[www windstream net email login](#)

Reply

emailssupport 24 September 2020 at 12:13

Thanks for sharing this great article. Hi, I am John Smith, I am working as a technical manager at email support. I have 3 years of experience in this field. If you have any problems related to the [iCloud email login issue](#), then please contact for instant help related to email problems.

Reply

alexa kane 25 September 2020 at 08:37

[ij.start canon](#) will manual you to Install Canon printer brand new updated drivers, for Canon printer setup you could additionally visit [http //ij.start.canon](http://ij.start.canon) . It is very easy to set up a canon printer by visiting [ij.start.canon](#) official website. Canon printer that can be downloaded via canon.com/ijsetup page is the best wireless printer that you can connect to your device and print data smoothly. Canon printer that can be downloaded via canon.com/ijsetup page is the best wireless printer that you can connect to your device and print data smoothly.

Reply

jack smith 28 September 2020 at 06:51

Before knowing about the process to connect the printer to the computer or other devices, we can see about the canon [ijsetup](#). [ij.start canon](#) | [http //ij.start.canon](http://ij.start.canon) | [ij.start.canon](#). The [Family Tree Search](#) site has several methods to approach the research. One can go over the long listing of U. S. states, of provinces and territories of numerous nations.

jack smith 28 September 2020 at 06:52

[webroot.com/safe](https://www.webroot.com/safe) antivirus software assures the user with the best defense for their computers.

Reply

PlentyOfFish 29 September 2020 at 04:37

Pof Mobile Login: Your post is very great.I read this post and this is very helpful. If You are aged between 25-34 and searching for dating apps then you must go through Plenty Of Fish which is a popular dating website by using Pof Mobile Login

Reply

Unknown 29 September 2020 at 06:05

Trend Micro Software, a highly rated antivirus software that can be easily installed and run fast. Within a few seconds, it can defend yourself and your family. You can plan it manually or you can Scan automatically. Trend Micro will continue to defend you day and night. However check out the Prerequisite before download and install Trend Micro on your PC.

www.trendmicro.com.au/downloadme | www.trendmicro.com/downloadme | trendmicro.com/downloadme

Reply

Unknown 29 September 2020 at 06:08

Canon IJ Setup Network Tool is a utility software that allows you to change the Network settings of your printer The same one that you entered in [ij.start canon](https://ij.start.canon) to start the whole process Now, navigate to the Official website of Canon by inserting ij.start.canon in the address bar. Open any of the web browsers that you usually use on your computing device and put the web address within the URL bar of your browser correctly [ij start canon](https://ij.start.canon)

Reply

Unknown 29 September 2020 at 06:11

Norton offers support to install Norton internet security in your device from norton.com/setup the software on the computer the same way we, here at superb support, offer premium services to support the user to install www.norton.com/setup and other antivirus programs and other computer related issues.

Reply

Caleb 29 September 2020 at 10:27

Your article is fascinating. Thank you for sharing. CIPD Assignment Help is the leading platform in the delivery of premium CIPD assignments across the globe. Our team consists of professional and experienced writers who strive to deliver high-quality assignments to all the clients. We have helped thousands of students in the colleges and universities acquire excellent grades which they so desire. In regards to the excellent results, the clients keep on coming back to us and even referring more clients to us. Our team only delivers the best to its clients. Learn more on on [CIPD Assignment Help](https://www.cipdassignmenthelp.com) .

Reply

Assignment Help 30 September 2020 at 11:42

Online Assignment Help is the effective source of getting experts' help for composing academic papers. Connecting with the well-qualified professionals [Assignment Help](https://www.assignmenthelp.com) ws you to acquire top grades and complete knowledge of any subject. By using [Assignment Help](https://www.assignmenthelp.com) services, students can complete their assignment on time.

Students who have no ideas how to start their papers, they can search for greatassignmenthelp.com to compose their documents.

Online Assignment Help

Reply

Unknown 1 October 2020 at 11:46

This must be a popular blog. Thank you for sharing such an informative article. The goal of every student is to attain high grades no matter the level they are in. However, they may find themselves in circumstances that prompt them to look for help in online platforms like CIPD Assignment Help. Below are some of the things that make students look for assignment help. Learn more on on [CIPD Assignment Help AE](#) .

Reply

sofihayat 1 October 2020 at 16:48

Thanks for sharing post.

Hi, I am Sofi Hayat, I am working as a tech expert at email support. I have 3 years of experience in this field. If you have any problems related to **Bellsouth email login problems**, etc, then please contact for instant help related to email problems.

Reply

John Cooper 7 October 2020 at 09:35

The online [taxation assignment help](#) is valued at an insignificant rate to ensure that it tends to be managed by students. It is hard to benefit profoundly evaluated administrations for students which is the reason we at [allassignmentsservices](#) charge just half before the assignment and the rest is to be paid after the conveyance of the assignment.

Reply

James Smith 16 October 2020 at 10:38

We use safe and effective techniques on our patented wheel straightening system. Our safety inspection process requires the technician to measure run-out and check for hidden cracks using a dye penetrant and blacklight. If our inspection determines that a bent wheel is safe to [straighten alloy wheel](#) Repair Specialists will straighten using our pressure relaxation wheel straightening system.

Reply

James Smith 16 October 2020 at 10:39

This has been driven by recent rapid advances in data, analytics, and digital technology, which have created the perfect storm in retail [Banking Decision](#) making.

[Academic Session](#) - the time during which a school holds classes; "they had to shorten the school term"

This includes solar energy, clean forms of transportation, green building and water. [Clean tech market today](#) is like Internet was 20 years ago.

Just before the annual [holiday takeover](#), Dasher twisted his fetlock. He landed wrong during a hotly contested reindeer game.

I am obviously biased, but I think it is the best way to [grow web traffic](#) without SEO.

Reply

James Smith 16 October 2020 at 10:39

Do you have a piece of furniture that you love, but it's looking a little ragged? Instead of purchasing a replacement you could have it upholstered. And, it's pretty [solid business idea](#) as well.

[Self care advise](#) is about how you avoid becoming ill, treat common everyday illnesses and seek help when you need it as well as keeping fit and healthy.

Wondering how to get the vehicle information? No worries! You can install the RTO vehicle information application that helps you to get the [vehicles detail](#). It takes only a few minutes to install the app and you can now find it easy to get familiar with the accurate information.

If you are ardent to take part in a [VVIP property](#) New Launch, you will generally need to provide following items: Finalized authorization form, signifying the units you are intent in, stating your comfortable price range, personal particulars and endorsement of the authorization form.

An [law ordinance](#) is a law enacted by a municipal body, such as a city council or county commission (sometimes called county council or county board of supervisors). Ordinances govern matters not already covered by state or federal laws such as zoning, safety and building regulations.

Provides consumer product companies like Coca-Cola and Procter & Gamble [Insights](#) on product sales volumes and purchasing trends.

[Reply](#)

G Plus 17 October 2020 at 09:11

Really informative and inoperative, Thanks for the post and effort! Please keep sharing more such blog.

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