

# Teaching calculus as ganita

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## Summary:

The West [stole the calculus](#) from India,<sup>1</sup> and Newton and Leibniz [claimed its “discovery”](#), on the [evil doctrine of Christian discovery](#), the way Vasco claimed to have “discovered” India ([or the sea-route to India](#)<sup>2</sup>). There is ample proof of **theft** of calculus (as distinct from transmission) on criminal law: opportunity, motivation, circumstantial and documentary evidence.<sup>3</sup> The apologia of “independent rediscovery” is ruled out [by my epistemic test](#): knowledge thieves, like students who cheat in an exam, do not **fully** grasp what they steal. Therefore, the West failed to fully understand the Indian calculus, particularly how to sum Indian infinite series exactly. Recognizing this failure to understand calculus, two centuries after Newton, the West invented real numbers and axiomatic set theory needed for that, an excessively complex way to understand calculus. So complex that [California recently canceled calculus teaching in schools](#).

Reverting to calculus as [ganita](#) ( $\neq$  [axiomatic mathematics](#)) makes calculus easy and enables students to solve harder practical problems as has been demonstrated in teaching experiments now with 8 groups in 5 universities in 3 countries.<sup>4</sup> Instead of teaching calculus as symbolic manipulation of integrals and derivatives of elementary functions, this teaches calculus as the numerical solution of differential equations, a technique first invented by the fifth century Aryabhata, and used in all current practical applications of calculus, such as sending a rocket to the moon. Instead of real numbers, this teaches Brahmagupta’s (non-Archimedean) arithmetic. Instead of exactitude, this uses the opposite philosophy of inexactitude called Zeroism<sup>5</sup> (sunyavada).<sup>6</sup>

However, due to colonial indoctrination, the colonized university mathematicians are **terrified** of even openly discussing why they reach real numbers as essential for calculus, and persistently and unethically [flee from open debate](#) on what they teach in the classroom. As explained in the prologue, their sole standard of “truth” is approval by Western authority. Therefore, they will let students suffer while they just sit and wait for the West to approve, which the West will never do because its key myth of “superiority” in math would collapse, and it would be exposed that the West was very backward in math, at least [3000 years behind Indians and Egyptians](#), and therefore obtained almost all its math, starting from elementary arithmetic, from India,<sup>7</sup> but had difficulties understanding it, [such as negative numbers](#).<sup>8</sup>

A reading list is posted at <https://tinyurl.com/decol-list-new>. (Note: First read the [prologue on colonialism and math](#).)

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- 1 C. K. Raju, *Cultural Foundations of Mathematics: The Nature of Mathematical Proof and the Transmission of Calculus from India to Europe in the 16th c, CE* (Pearson Longman, 2007).
  - 2 Vasco came from Africa to India with the help of an Indian navigator whose instrument, the kamal, he carried back with him. See, “Kamal on Rapalagai” in *Cultural Foundations of Mathematics*, cited above.
  - 3 C. K. Raju, ‘Computers, Mathematics Education, and the Alternative Epistemology of the Calculus in the YuktiBhâsâ’, *Philosophy East and West* 51, no. 3 (2001): 325–62, <https://muse.jhu.edu/article/26555/pdf>. For an extract see [http://ckraju.net/papers/HAWAIIpp26\\_32.pdf](http://ckraju.net/papers/HAWAIIpp26_32.pdf).
  - 4 C. K. Raju, ‘Teaching Mathematics with a Different Philosophy. 1: Formal Mathematics as Biased Metaphysics’, *Science and Culture* 77, no. 7–8 (2011): 274–79; C. K. Raju, ‘Teaching Mathematics with a Different Philosophy. 2: Calculus without Limits’, *Science and Culture* 77, no. 7–8 (2011): 280–85; C. K. Raju, ‘Decolonising Mathematics’, *AlterNation* 25, no. 2 (2018): 12–43b.
  - 5 C. K. Raju, ‘Zeroism’, in *Encyclopedia of Non-Western Science, Technology and Medicine*, ed. Helaine Selin (Dordrecht: Springer, 2016), <http://ckraju.net/papers/Springer/zeroism-springer-f.pdf>.
  - 6 C. K. Raju, ‘California, Indian Calculus and the Technology Race. 2: Don’t Cancel the Calculus, Make It Easy!’, *Boloji.Com*, 24 December 2021, <https://www.boloji.com/articles/52950/california-indian-calculus-and>.
  - 7 C. K. Raju, ‘Precolonial Appropriations of Indian Ganita: Epistemic Issues’ (International round table on Indology, IAS, Shimla, 2020), <http://ckraju.net/papers/ckr-indology-abstract.pdf>.
  - 8 C. K. Raju, ‘In Black History Month: A Response to Nature’s Editorials on Decolonising Mathematics’, *Medium* (blog), 26 February 2023, [https://medium.com/@c\\_k\\_raju/in-black-history-month-a-response-to-natures-editorials-on-decolonising-mathematics-cadc124fb2c8](https://medium.com/@c_k_raju/in-black-history-month-a-response-to-natures-editorials-on-decolonising-mathematics-cadc124fb2c8).