Letter to the editors

Marx and Mathematics

The article 'Calculus: A Marxist Approach' (*Gazette* **36(4)**, 2009) interested me because I had already been made aware of Marx's work on the subject. Indeed I have myself written a paper about this topic, due to appear in the School Mathematics journal *Parabola* (for which I write a regular History of Mathematics column) either late this year or early next. Readers may care to read this and to compare my assessment with that offered by Fahey *et al.* in the *Gazette*.

Essentially, I take a less generous approach to Marx's writings than do these authors. As I said in my article:

> [Marx's investigations] all display a wide and deep acquaintance with the various attempts to address the logical difficulties [with Calculus], but there is one important omission: Cauchy.

It may be that Marx was unaware of Cauchy's work (as I am inclined to believe) or it may be that he thought it a simple reworking of an approach by d'Alembert (as Struik suggests in the article quoted by Fahey *et al.*).

What is clear, however, is that the d'Alembert approach (ignoring the concept of a limit, but stressing the order of operations, forming the quotient $\frac{f(X+\Delta X)-f(X)}{\Delta X}$ and putting $\Delta X = 0$ *after* simplifying this expression rather than before) is capable of yielding derivatives of rational functions and even algebraic ones, but is quite inadequate when it comes to finding derivatives for (for example) $\sin x$. Marx avoids the difficulties this entails by simply ignoring such cases. He deals only with much simpler functions.

However, it is known that Marx read Boucharlat's text (Fahey *et al.*'s reference [1]), and although this does not quote Cauchy (indeed its second edition predates Cauchy's *Cours d'analyse*), it does employ the notion of a limit, and furthermore applies it to the differentiation of $\sin x$ in exactly the way modern textbooks do. It would seem that certainly Marx, and very possibly Struik as well, were not paying attention!

My overall assessment is that:

> ... to my mind, Marx actually contributed very little to the debate over the foundations of Calculus. His writing came too late; the key issue was already resolved, and furthermore his analyses are prolix and clumsy. They seem to beat about the bush and become repetitive while hardly advancing at all. The distinctions he makes between the various pre-Cauchy approaches are subtle, perhaps overly so, but ultimately beside the point.

A similar view is expressed rather more trenchantly by Jacob Kesinger in the course of a review of Paulus Gerdes's *Marx Demystifies Mathematics*: 'Marx succeeds only in moving the handwaving from one area to another'. (This review is posted on the Amazon website.)

This negative view seems to me the right one to take despite the attempts by Kennedy and others (as referenced by Fahey *et al.*) and by Struik, Dauben and Gerdes (as referenced in my own article) to argue otherwise.

I also discount, as does Struik, the view that Marx's mathematical endeavours were influenced by his philosophy of dialectical materialism. Kennedy is disingenuous on this point, taking the 'negation of a negation' as an example of dialectic. As for Kol'man and those other authors whose work is included with Marx's in Fahey *et al*'s reference [8], it should be borne in mind that if one lives in a dictatorship, it is very wise to genuflect reverently to the prevailing ideology!

I conclude my paper by saying:

> All in all, I regard Marx's contributions to Mathematics as negligible, although it is of interest that they exist and are now available. However, if some other less famous author had produced them, no-one would have taken the slightest notice!

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