Digest 6

(A compilation of emailed homework questions, answered around Tuesday.)

Question. [This question is specific to the 10AM Section 39432 lecture's midterm exam]

(From a student): I got a point off on Question 4b, and I was curious why this happened. The question was:

For the following functions, determine whether or not $f'(0)$ exists. If $f'(0)$ exists, compute its value.

(b) $f(x) = x^{1/3}$.

My answer was: $f'(x) = (1/3)x^{-2/3}$, so $f'(0) = \lim_{x\to 0}(1/3)x^{-2/3} = \infty$, so $f'(0)$ DNE.

Answer. This was a very common answer and pretty much everyone got at least one point off of this question. (So, because the class is curved, equivalently no one got any points off this part.) Anyway, the solution proceeds by going back to the definition of the derivative:

$$f'(0) = \lim_{h\to 0} \frac{f(h) - f(0)}{h} = \lim_{h\to 0} \frac{f(h)}{h} = \lim_{h\to 0} \frac{h^{1/3}}{h} = \lim_{h\to 0} h^{-2/3}.$$

The quantity $h^{-2/3}$ becomes arbitrarily large as $h \to 0$ since $h^{2/3}$ goes to zero as $h \to 0$, so the limit does not exist, i.e. $f'(0)$ DNE.

Note that this solution is slightly different than your answer. First of all, the formula $f'(x) = (1/3)x^{-2/3}$ is only valid when $x \neq 0$. So, it is not guaranteed that $f'(0)$ has anything to do with this formula. It is a coincidence that your answer and the solution do in fact reduce to the same limit being infinity. It could very well have been the case that $\lim_{x\to 0} f'(x) = \infty$ but $f'(0) = 0$. (This did not happen in this case, but it was not excluded by your answer.) Anyway, maybe it was pedantic of me to take a point off for this minor issue, but like I said since the grade is curved, the grading is probably not affected by taking away the point.

Question. (From a student): Can you post solutions to the quiz before the quiz occurs?

Answer. I will not do this, however if you ask me specific questions about quiz material, I will answer them and give hints, either in person or in this digest.

Question. [This isn't quite a question but I heard one or two comments concerning communication issues with a TA. So, I'm just going to post this link for https://writingcenter.unc.edu/tips-and-tools/international-tas/ working with international TAs. For example, one suggestion is: Speak more slowly and clearly, though still naturally. Even with excellent English, many international TAs have a hard time when people speak quickly.]