

Correction to Lecture 31

April 2, 2014

In the review lecture I discussed the following problem:

Problem. Let $f(x) = -\cos\left(\frac{1}{1+2^x}\right)$.

- (a) Compute $f'(x)$.
- (b) Compute $f''(x)$.

In discussing part (b) I used logarithmic differentiation and at some point I had to compute the derivative of

$$\ln\left(-\sin\left(\frac{1}{1+2^x}\right)\right).$$

However, at this point I made a mistake in applying the chain rule. The correct derivative is

$$\begin{aligned}\frac{d}{dx} \ln\left(-\sin\left(\frac{1}{1+2^x}\right)\right) &= \left(\frac{1}{-\sin\left(\frac{1}{1+2^x}\right)}\right) \left(-\cos\left(\frac{1}{1+2^x}\right)\right) \left(\frac{-1}{(1+2^x)^2}\right) (2^x \ln(2)) \\ &= \frac{-2^x \ln(2)}{(1+2^x)^2} \cot\left(\frac{1}{1+2^x}\right)\end{aligned}$$

When I did this calculation in lecture I omitted the term $-\cos(1/(1+2^x))$, affecting this answer and the resulting expression for $f''(x)$.