

A summary of Corey's incompetence

By: Corey's shame closet

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Earlier today in class Corey couldn't answer a good question by somebody about the homework. I, Corey's shame closet, had to listen to Corey whine and sob all afternoon about how he couldn't answer the question in class – I'm so tired of it I told him that I'd type up my own solution and post it on the internet. Jeez, if it's not one thing, it's another. Ahhh, the life of Corey's shame closet is an active one.

Question: Compute the derivative of the function $f(x) = \frac{4}{\sqrt{x}}$ using the limit definition of the derivative.

Answer:

$$\begin{aligned} f(x + \Delta x) &= \frac{4}{\sqrt{x + \Delta x}} \\ f(x + \Delta x) - f(x) &= \frac{4}{\sqrt{x + \Delta x}} - \frac{4}{\sqrt{x}} \\ &= \frac{4\sqrt{x} - 4\sqrt{x + \Delta x}}{4\sqrt{x}\sqrt{x + \Delta x}} \\ &= \frac{\sqrt{x}\sqrt{x + \Delta x}}{4\sqrt{x}\sqrt{x + \Delta x}} \cdot \frac{4\sqrt{x} + 4\sqrt{x + \Delta x}}{4\sqrt{x} + 4\sqrt{x + \Delta x}} \\ &= \frac{16x - 16(x + \Delta x)}{(\sqrt{x}\sqrt{x + \Delta x})(4\sqrt{x} + 4\sqrt{x + \Delta x})} \\ &= \frac{-16\Delta x}{(\sqrt{x}\sqrt{x + \Delta x})(4\sqrt{x} + 4\sqrt{x + \Delta x})} \\ \frac{f(x + \Delta x) - f(x)}{\Delta x} &= \frac{-16}{(\sqrt{x}\sqrt{x + \Delta x})(4\sqrt{x} + 4\sqrt{x + \Delta x})} \\ \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} &= \lim_{\Delta x \rightarrow 0} \frac{-16}{(\sqrt{x}\sqrt{x + \Delta x})(4\sqrt{x} + 4\sqrt{x + \Delta x})} \\ &= \frac{-16}{\sqrt{x}\sqrt{x}(4\sqrt{x} + 4\sqrt{x})} \\ &= \frac{-16}{8x^{3/2}} = \frac{-2}{x^{3/2}}. \text{ ROCK ON.} \end{aligned}$$