

Math 170: Quiz 9

Sayan Mukherjee's discussion

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Problem 1. Use the definition of the derivative (not the power rule) to compute $f'(x)$, where $f(x) = 2\sqrt{x}$.

Solution. Observe that,

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{2\sqrt{x+h} - 2\sqrt{x}}{h} \\ &= \lim_{h \rightarrow 0} \frac{2(\sqrt{x+h} - \sqrt{x})}{h} \\ &= \lim_{h \rightarrow 0} \frac{2(\sqrt{x+h} - \sqrt{x})(\sqrt{x+h} + \sqrt{x})}{h(\sqrt{x+h} + \sqrt{x})} \\ &= \lim_{h \rightarrow 0} \frac{2(x+h-h)}{h(\sqrt{x+h} + \sqrt{x})} \\ &= \lim_{h \rightarrow 0} \frac{2}{\sqrt{x+h} + \sqrt{x}} \\ &= \frac{2}{2\sqrt{x}} \\ &= \frac{1}{\sqrt{x}}. \end{aligned}$$

□

Rubric.

- Left to the grader's discretion