

KEY

Math 125-Quiz 11¹
September 28, 2011

You have ten minutes to complete this quiz.

1. Suppose that $f(x)$ is a continuous function. What is the slope of the tangent line to $f(x)$ when $x = a$?

$$f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

2. Determine the equation of the tangent line to $f(x) = x^2 + 3$ when $x = 2$. (Be sure to show all of your work with limits here...)

$$\begin{aligned} \text{slope: } \lim_{h \rightarrow 0} \frac{(2+h)^2 + 3 - (2^2 + 3)}{h} &= \lim_{h \rightarrow 0} \frac{4 + 4h + h^2 + 3 - (4 + 3)}{h} \\ &= \lim_{h \rightarrow 0} \frac{4h + h^2}{h} = \lim_{h \rightarrow 0} 4 + h = 4 \end{aligned}$$

point $(2, 7)$: line $(y - 7) = 4(x - 2)$

3. Determine the slope of the tangent line to $f(x) = \sqrt{x}$ when $x = 4$. (...and here.)

Slope: $\lim_{h \rightarrow 0} \frac{\sqrt{4+h} - \sqrt{4}}{h} = \lim_{h \rightarrow 0} \left(\frac{\sqrt{4+h} - 2}{h} \right) \left(\frac{\sqrt{4+h} + 2}{\sqrt{4+h} + 2} \right)$

$$= \lim_{h \rightarrow 0} \frac{(4+h) - 4}{h(\sqrt{4+h} + 2)} = \lim_{h \rightarrow 0} \frac{1}{\sqrt{4+h} + 2} = \frac{1}{\sqrt{4} + 2} = \frac{1}{4}$$

¹You are excused to leave when you're finished with this quiz.