1. $f(x) = 4x^2 + 3$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$* \quad = \lim_{h \to 0} \frac{(4(x+h)^2+3) - (4x^2+3)}{h}$$

$$= \lim_{h \to 0} \frac{(4x^2+8xh+4h^2+3)-(4x^2+3)}{h}$$

$$= \lim_{h \to 0} \frac{8xh+4h^2}{h}$$

$$= \lim_{h \to 0} \frac{4\cancel{h}(2x+h)}{\cancel{h}}$$

$$f'(x) = 8x$$

Nov 19-10:05 AM

2. $f(x) = \sqrt{x+2}$

$$f'(x) = \lim_{h \to 0} \left[\frac{\sqrt{x+h+2} - \sqrt{x+2}}{h}\right]\left[\frac{\sqrt{x+h+2}+\sqrt{x+2}}{\sqrt{x+h+2}+\sqrt{x+2}}\right]$$

$$= \lim_{h \to 0} \frac{(\cancel{x}+h+\cancel{2}) - (\cancel{x}+\cancel{2})}{h(\sqrt{x+h+2}+\sqrt{x+2})}$$

$$= \lim_{h \to 0} \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h+2}+\sqrt{x+2})}$$

$$= \frac{1}{\sqrt{x+2}+\sqrt{x+2}}$$

$$= \frac{1}{2\sqrt{x+2}}$$

Nov 19-10:12 AM

③ $f(x) = \dfrac{x}{x+1}$

$$f'(x) = \lim_{h \to 0} \frac{\dfrac{x+h}{x+h+1} - \dfrac{x}{x+1}}{h}$$

$$= \lim_{h \to 0} \frac{\dfrac{(x+h)(x+1) - x(x+h+1)}{(x+h+1)(x+1)}}{h}$$

* KEEP DEN. FACTORED

$$= \lim_{h \to 0} \frac{\cancel{x^2} + \cancel{xh} + \cancel{x} + h - \cancel{x^2} - \cancel{xh} - \cancel{x}}{(x+h+1)(x+1)(h)}$$

$$= \lim_{h \to 0} \frac{\cancel{h}}{\cancel{h}(x+h+1)(x+1)}$$

$$= \frac{1}{(x+1)^2}$$

Nov 19-10:17 AM

Quiz Thursday

Write Equation of The Tangent Line:

① $f(x) = 3x^2 + 6x$ at $x = 2$

② $f(x) = \sqrt{x+4}$ at $x = 5$

③ $f(x) = \dfrac{3x}{2x+1}$ at $x = 4$

④ Use Defn of Derivative

$f(x) = x^2 + 5x$

$f'(x) = ?$

#1 - #3 $\boxed{f'(a) = \lim_{x \to a} \dfrac{f(x) - f(a)}{x - a}}$

Nov 19-10:31 AM

$$f(x) = \frac{1}{x}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \to 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$$

$$= \lim_{h \to 0} \frac{\frac{\cancel{x} - (\cancel{x}+h)}{x(x+h)}}{h}$$

$$= \lim_{h \to 0} \frac{-\cancel{h}}{x(x+h)(\cancel{h})}$$

$$= \frac{-1}{x^2}$$

$x=2$ $m = \frac{-1}{4}$

$x=3$ $m = \frac{-1}{9}$

$x=1$ $m = \frac{-1}{1}$

Nov 19-11:18 AM

Sample $f(x) = \underbrace{2x^2 + 7x}$ at $x = 3$ (a)

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$ NEW

$$= \lim_{x \to 3} \frac{2x^2 + 7x - 39}{x - 3}$$

$y = -4$

$$= \lim_{x \to 3} \frac{(2x+13)\cancel{(x-3)}}{\cancel{(x-3)}}$$

$\therefore (y - 39) = 19(x - 3)$

$= 19$

Nov 19-11:29 AM

Nov 19-1:16 PM