

$$f(x) = \frac{x+1}{2x+3} \quad (a, \frac{a+1}{2a+3}) \quad (a+h, \frac{a+h+1}{2(a+h)+3})$$

$$f'(a) = \lim_{h \rightarrow 0} \frac{\frac{a+h+1}{2a+2h+3} - \frac{a+1}{2a+3}}{h} \cdot \frac{(2a+3)(2a+2h+3)}{(2a+3)(2a+2h+3)}$$

$$f'(a) = \lim_{h \rightarrow 0} \frac{(a+h+1)(2a+3) - (a+1)(2a+2h+3)}{h(2a+3)(2a+2h+3)}$$

$$f'(a) = \lim_{h \rightarrow 0} \frac{2a^2+3a+2ah+3h+2a+3 - (2a^2+2ah+3a+2a+2h+3)}{h(2a+3)(2a+2h+3)}$$

$$= \lim_{h \rightarrow 0} \frac{2a^2+3a+2ah+3h+2a+3 - 2a^2-2ah-3a-2a-2h-3}{h(2a+3)(2a+2h+3)}$$

$$= \lim_{h \rightarrow 0} \frac{1}{h(2a+3)(2a+2h+3)}$$

$$= \frac{1}{(2a+3)(2a+0+3)} = \frac{1}{(2a+3)^2}$$

Sep 16-2:06 PM

$$f(x) = \sqrt{4x+1} \quad (a, \sqrt{4a+1}) \quad (a+h, \sqrt{4(a+h)+1})$$

$$f'(a) = \lim_{h \rightarrow 0} \frac{\sqrt{4a+4h+1} - \sqrt{4a+1}}{h} \cdot \frac{(\sqrt{4a+4h+1} + \sqrt{4a+1})}{(\sqrt{4a+4h+1} + \sqrt{4a+1})}$$

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

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

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

$$= \frac{2}{2\sqrt{4a+1}} = \frac{1}{\sqrt{4a+1}}$$

Sep 16-2:20 PM

$y = 40t - 16t^2$ $t = \text{time in seconds}$
 $y = \text{height in feet}$

$v = \frac{\text{dist}}{\text{time}} = \frac{y_2 - y_1}{t_2 - t_1}$

instantaneous velocity of $t = 2$ seconds
 $y = 40 \cdot 2 - 16 \cdot 2^2 = 80 - 64 = 16$

$$v = \lim_{h \rightarrow 0} \frac{40(2+h) - 16(2+h)^2 - (16)}{2+h-2} = \lim_{h \rightarrow 0} \frac{80+40h-16(4+4h+h^2)-16}{h}$$

$$= \lim_{h \rightarrow 0} \frac{80+40h-64-64h-16h^2-16}{h} = \lim_{h \rightarrow 0} \frac{-24h-16h^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{-24-16h}{1} = -24 \frac{\text{ft}}{\text{sec}}$$

$y = 40t - 16t^2$ avg rate of change $[2, 2.5]$
 $(2, 16) \quad (2.5, 0) \quad v = \frac{0-16}{2.5-2} = \frac{-16}{.5} = -32 \frac{\text{ft}}{\text{sec}}$

Sep 16-2:31 PM

sec 3.1 # 5, 7, 15, 14ab, 27, 28, 30
 p. 120

Sep 16-2:46 PM