Name_____KEY_____ Section 0242

Answer all problems. There are 10 possible points.

1)   The distance in feet of an object from a starting point is given by $S(t) = 4t + 1$, where t is time in seconds.

    (a) (3 pts) Find the average velocity of the object from 6 seconds to 8 seconds.

$$\frac{S(8) - S(6)}{8 - 6} = \frac{(4(8) + 1) - (4(6) + 1)}{2} = \frac{33 - 25}{2} = \frac{8}{2} = 4 \text{ feet per second}$$

    (b) (3pts) Find the instantaneous velocity at 2 seconds.

$$\lim_{h \to 0} \frac{S(2 + h) - S(2)}{h} = \lim_{h \to 0} \frac{(4(2 + h) + 1) - (4(2) + 1)}{h} = \lim_{h \to 0} \frac{4h}{h} = 4 \text{ feet per second}$$

2) (4pts) Use the limit definition of derivative to find $f'(x)$ when $f(x) = 5\sqrt{x}$.

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

$$= \lim_{h \to 0} \frac{5\sqrt{(x + h)} - 5\sqrt{x}}{h}$$

$$= \lim_{h \to 0} \frac{5(\sqrt{(x + h)} - \sqrt{x})(\sqrt{(x + h)} + \sqrt{x})}{h(\sqrt{(x + h)} + \sqrt{x})}$$

$$= \lim_{h \to 0} \frac{5(x + h - x)}{h(\sqrt{(x + h)} + \sqrt{x})}$$

$$= \frac{5}{2\sqrt{x}}.$$