

Math 4 Honors

Quiz Review: Lessons 6-1 & 6-2

Name

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Date

1. Consider the following function: $f(x) = 3x^3 - 2x + 8$
Find the average rate of change from $x = -1$ to $x = 5$.

$$f(-1) = 7 \quad f(5) = 373$$

$$A_{\text{ROC}} = \frac{373 - 7}{5 - (-1)} = \frac{366}{6} = 61$$

2. Let f be the function $f(x) = 3x^2 - 2x + 4$. Use the definition of derivative to find $f'(4)$.

$$f'(x) = \lim_{\Delta x \rightarrow 0} \frac{3(x + \Delta x)^2 - 2(x + \Delta x) + 4 - (3x^2 - 2x + 4)}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{3(x^2 + 2x\Delta x + (\Delta x)^2) - 2x - 2\Delta x + 4 - 3x^2 + 2x - 4}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{\cancel{3x^2} + 6x\Delta x + 3(\Delta x)^2 - \cancel{2x} - 2\Delta x + \cancel{4} - \cancel{3x^2} + \cancel{2x} - \cancel{4}}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} \frac{6x\Delta x + 3(\Delta x)^2 - 2\Delta x}{\Delta x}$$

$$= \lim_{\Delta x \rightarrow 0} 6x + 3\Delta x - 2 = 6x - 2 \quad f'(4) = 6(4) - 2 = 22$$

3. Find the derivative of the function in #2 when $x = -8$. Is f increasing or decreasing when $x = -8$?

$$f'(-8) = 6(-8) - 2 = -50$$

Decreasing

4. A projectile follows along a path given by the formula $h(t) = 480t - 16t^2$. Find a formula for the difference quotient given the average rate of change for each interval t to $t + \Delta t$.

$$A_{\text{ROC}} = \frac{h(t + \Delta t) - h(t)}{\Delta t}$$

$$= \frac{480(t + \Delta t) - 16(t + \Delta t)^2 - (480t - 16t^2)}{\Delta t}$$

$$= \frac{\cancel{480t} + 480\Delta t - \cancel{16t^2} - 32t\Delta t - 16(\Delta t)^2 - \cancel{480t} + \cancel{16t^2}}{\Delta t}$$

$$= \frac{480\Delta t - 32t\Delta t - 16(\Delta t)^2}{\Delta t}$$

$$= 480 - 32t - 16\Delta t$$

OVER →

$$480 - 32t - 16\Delta t$$

5. Use your answer from #4 and $t = 6$ to find the average velocity when ...

a.) $\Delta t = 2$

$$AV = \frac{480 - 32(6) - 16(2)}{2} = 256 \text{ ft/sec}$$

b.) $\Delta t = 1$

c.) $\Delta t = .5$

d.) $\Delta t = .01$

$$\frac{480 - 32(6) - 16(.01)}{.01} = 287.84 \text{ ft/sec}$$

$$\lim_{\Delta t \rightarrow 0} \left(\frac{h(6 + \Delta t) - h(6)}{\Delta t} \right) = 288 \text{ ft/sec}$$

6. Refer to the graph at the right.

a. Find the average rate of change from A to C.

$$A_{ROC} = \frac{6-1}{2-0} = \frac{5}{2}$$

b. Over what interval is the average rate of change of f zero?

$$B \rightarrow E \text{ or } D \rightarrow F$$

c. Find the average rate of change in f over the interval $0 \leq x \leq 8$.

$$A_{ROC} = \frac{5-1}{8-0} = \frac{4}{8} = \frac{1}{2}$$

d. Give a value of x for which $f'(x)$ is negative.

Anything from 2 to 7

e. Estimate f' when $x = 4$.

$$f'(4) = -1$$

