Definition of Derivative : Name______________________________ Section:__________ Date:_________________

20 points

must have both $f'(x)$ and $(-)$ correct for this point

if $(+)$, then (-1) or $\cdot$ or $\div$

20

1. Write the definition of derivative. Use proper mathematical notation.

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

5

2. Find the formula that computes the slope of the curve at any x (i.e. find it's derivative) for $f(x) = 5 - 3x - x^2$. Use the definition of derivative. Use proper notation.

$$f'(x) = \lim_{\Delta x \to 0} \frac{5 - 3(x+\Delta x) - (x+\Delta x)^2 - (5 - 3x - x^2)}{\Delta x}$$

every step

$$= \lim_{\Delta x \to 0} \frac{5 - 3x - 3\Delta x - (x^2 + 2x\Delta x + (\Delta x)^2) - 5 + 3x + x^2}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{\cancel{5} - \cancel{3x} - 3\Delta x - \cancel{x^2} - 2x\Delta x - (\Delta x)^2 - \cancel{5} + \cancel{3x} + \cancel{x^2}}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{-3\Delta x - 2x\Delta x - \Delta x^2}{\Delta x} = \lim_{\Delta x \to 0} (-3 - 2x - \Delta x) = \boxed{-3 - 2x}$$

correct work all way through 0-1-2 scale

9

3. Find the slope for the function in #2 when $x = 7$. Use proper notation.

$$m \text{ or } f'(7) = -3 - 2(7) = -3 - 14 = \boxed{-17}$$

2

4. Fill in the blank: This represents the ___Slope___ of the tangent line to the function at x=7.

1

5. Write the equation of the tangent line to the function in #2 at $x = 7$.

$$f(7) = 5 - 3(7) - (7)^2 = 5 - 21 - 49 = -16 - 49 = -65$$

$$y = mx + b$$
$$-65 = -17(7) + b$$
$$-65 = -119 + b$$
$$b = +119 - 65 = +54$$

$$\boxed{y = -17x + 54}$$

any $y = mx + b$

$17 \times 7 = 119$; $119 - 65 = 54$

3

6. Want to know a shortcut? Compare f(x) and it's derivative from #2 then try to figure out a shortcut algorithm that might give you the same result (without using the definition of derivative). Write that algorithm below:

multiply by exponent; Subtract 1 from exponent

No points