Section 1.5 – More on Derivatives

Name_____

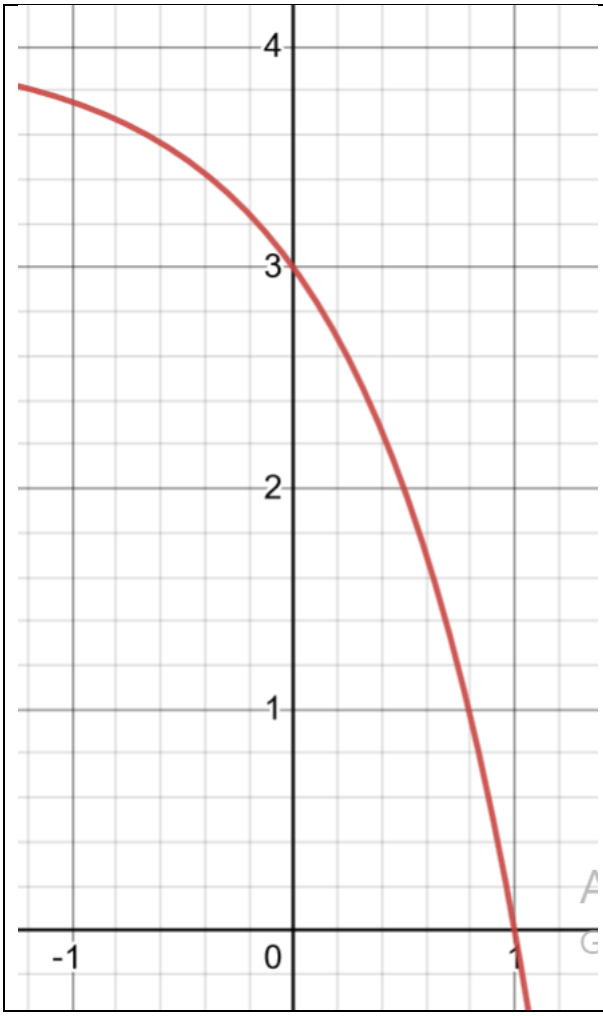
1. A function *f* is represented by the following table,
   a. Fill in the missing cells with the best possible approximation: you may choose to compute them using forward, backward, or centered differences.

Approximation of *f'(a)* using the forward difference quotient: $\frac{f(a+h)-f(a)}{h}$	Approximation of *f'(a)* using the backward difference quotient: $\frac{f(a)-f(a-h)}{h}$	Approximation of *f'(1)* using the centered difference quotient: $\frac{f(a+h)-f(a-h)}{2h}$

   b. What are the units of *f'(x)?*
   c. Describe a situation that could accompany this table. Tell a story.
   d. If *f'(a) = 0*, what is your best guess for *a?*

x=days	0	2	4	6
f(x)=height of water (meters)	4	6	6	4
f'(x)				

2. The function *f* is represented by the following graph.



Draw the tangent line to *f* at *x = 0* and use it to approximate *f'(0)*.

$f'(0) \approx$ _____

If *h* = 1, for each of the following difference quotients, draw the associated line and approximate *f'(0)*

A) Forward difference quotient

$f'(0) \approx$ _____

B) Backward difference quotient

$f'(0) \approx$ _____

C) Centered difference quotient

$f'(0) \approx$ _____

a. Why would these calculations suggest that the centered difference quotient works better than either the forward or backward differences?

b. Write the equation of the tangent line at x=0, based on your approximation of the slope above.

c. Describe what you can about the derivative function (you might include a crude sketch here).

3. Given that $y = f(x) = 2x^2$,
    a. Calculate *f'(x)* using the backward difference quotient, the forward difference quotient and the centered difference quotient.

    b. Verify that they all give the same answer.

    c. What makes you think that the centered difference quotient works best?

4. A function *f* is represented by the following table,
    a. Fill in the missing cells with the best possible approximation.
    b. What are the units of *f'(x)?*

    c. What does *f'* tell us about the situation*?*

X = weeks since Aug 1	0	1	2	3
f(x) =current Hospitalizations due to Covid	600	1000	1200	1300
f'(x)				

5. A function *f* has input and output as given in the table below:
   x = hours since 12:00 noon
   f(x) = mile marker on a highway
   a. What are the units of *f'(x)?*

   b. If *f(0) = 30,* fill in the missing row on the table and draw a possible approximate graph of *y = f(x)*

   c. Assume you're the driver of the car. Write a description of your car trip from 12:00 noon to 7:00 PM. Indicate when you are stopped, when and if you turn around, etc.

x = hours since 12:00 noon	0	1	2	3	4	5	6	7
f(x)=mile marker	30							
f'(x) = velocity	0	0	60	60	30	-60	0	0

6. Describe different real world situations (include the units of *x* and *y)* that would be consistent with the data provided:
   a. *f'(x) = 0,* $0 \leq x \leq 3$

   b. *f'(x) = 50,* $0 \leq x \leq 3$

   c. *f'(x)* is increasing as *x* increases, $0 \leq x \leq 3$

   d. *f'(x)* is decreasing as *x* increases, $0 \leq x \leq 3$