Name _____ Date _____ Class # _____ Block _____

# Intro to Calculus

## Homework 30 [1]

**Goals**

I can match the graph of a function with the graph of its derivative.

I can sketch the graph of the derivative function given the graph of the function.

I can use the definition of the derivative to create a derivative function of a function.

1. a. Sketch a smooth curve whose slope is both everywhere positive and increasing gradually.

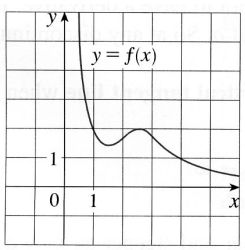
   b. Sketch a smooth curve whose slope is both everywhere positive and decreasing gradually.

   c. Sketch a smooth curve whose slope is both everywhere negative and increasing gradually (i.e., becoming less and less negative.)

   d. Sketch a smooth curve whose slope is both everywhere negative and decreasing gradually (i.e., becoming more and more negative.)

2. Use the given graph to estimate the value of each derivative. Then sketch the graph of $f'$.

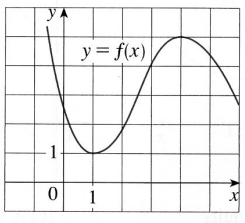
a.




i) $f'(1)$ ii) $f'(2)$

iii) $f'(3)$ i) $f'(4)$

b.

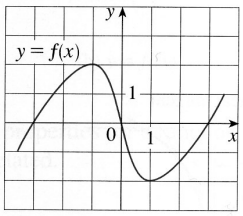



i) $f'(0)$ ii) $f'(1)$

iii) $f'(2)$ iv) $f'(3)$

v) $f'(2)$ vi) $f'(3)$

c.




i) $f'(-3)$ ii) $f'(-2)$

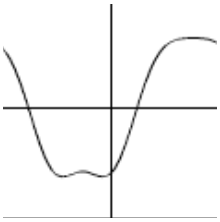
iii) $f'(-1)$ iv) $f'(0)$

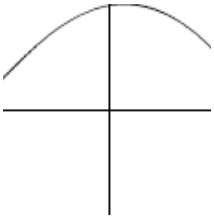
v) $f'(1)$ vi) $f'(2)$ vi) $f'(3)$

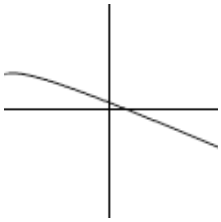
3. Play the "Derivative Matching Game" until you are good at it.

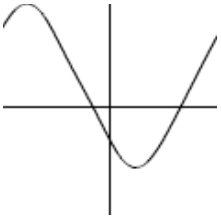
[1] Based on material from Calculus, Hughes-Hallet, p.110 from Calculus, Stewart p.144

4. Examine the graphs of the four following functions. One pair represents a function and its derivative function. Which pair? (If this is hard, then play the "Derivative Matching Game" some more!)

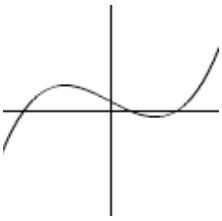
a. 

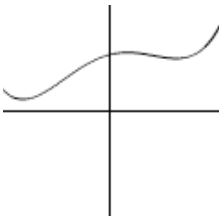
b. 

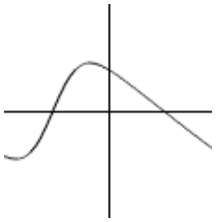
c. 

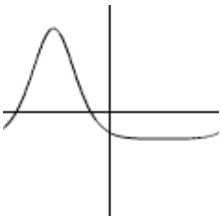
d. 

5. Same directions as problem 4.

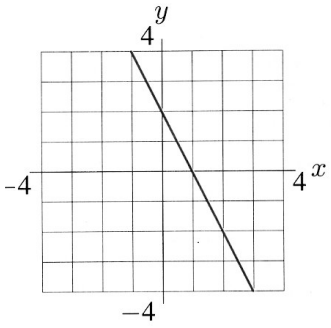
a. 

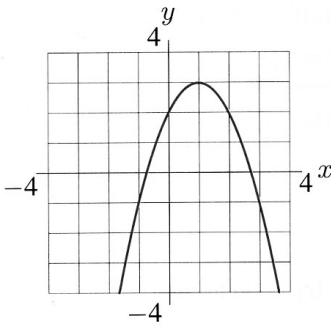
b. 

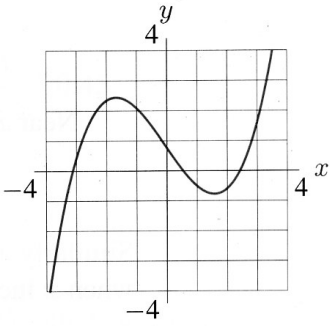
c. 

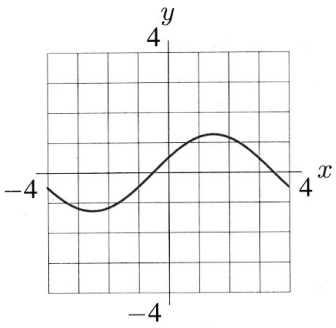
d. 

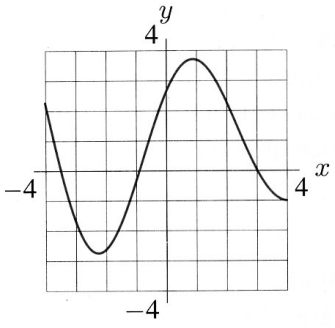
6. Sketch a graph of the derivative function of each of the given functions. (A nice video to help with this can be found here.)

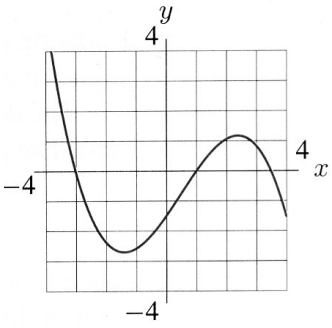
a. 


b. 


c. 

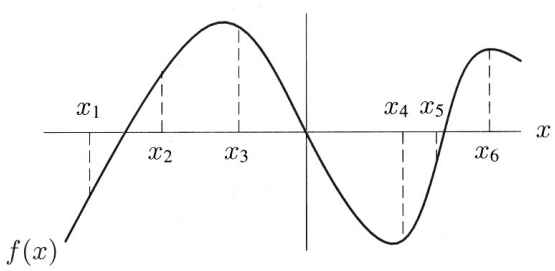

d. 


e. 


f. 

7. In the graph of $f$ , at which of the labeled $x$-values is

   a. $f(x)$ greatest? b. $f(x)$ least? c. $f'(x)$ greatest? d. $f'(x)$ least?



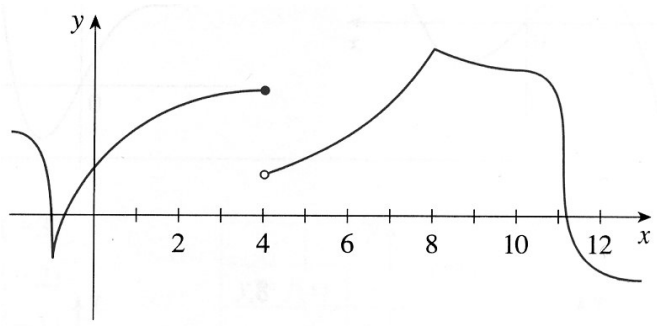

8. Draw a graph of a continuous function $y = f(x)$ that satisfies <u>all</u> three of the following conditions.

   (i) $f'(x) > 0,\ x < -2$ (ii) $f'(x) < 0,\ -2 < x < 2$ (iii) $f'(x) = 0,\ x > 2$

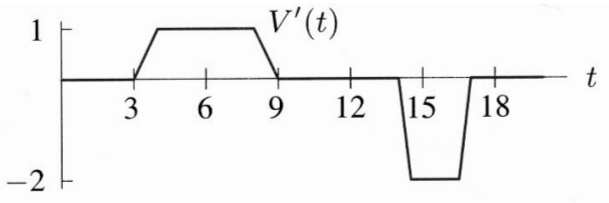
9. WIthout using a calculator, sketch a graph of $f(x)$. Then use that graph to sketch a graph of $f'(x)$.

   a. $f(x) = x^2$ b. $f(x) = x(x-1)$ c. $f(x) = \cos(x)$ d. $f(x) = \log(x)$

10. The graph of $f$ is given. State, with reasons, the numbers at which $f$ is not differentiable.




11. A child inflates a balloon, admires it for a while and then lets the air out at a constant rate. If $V(t)$ gives the volume of the balloon at time t, then the graph below shows $V'(t)$ as a function of t.




At what time does the child:

a. Begin to inflate the balloon?

b. Finish inflating the balloon?

c. Begin to let the air out?

d. What would the graph of $V'(t)$ look like if the child had alternated between pinching and releasing the open end of the balloon, instead of letting the air out at a constant rate?