Name _____ Date _____ Class # _____ Block _____

# Intro to Calculus

## Lesson for Homework 30: The Derivative Function

**Goals**

I can explain what is meant by "the derivative function".

I can explain the meaning of the two different types of derivatives.

I can sketch the derivative graph of a function.

I can sketch the graph of a function when given its derivative graph.

1. a. By moving point P on the sketch, find $h(1.4)$ and $h(1.5)$.

   b. Based on the values from part (a), calculate the approximate value of the derivative of $h(x)$ at $x = 1.4$.

   c. Look at the graph-- does your answer to (b) make sense? Why?

   d. Will your answer to part (c) be too high or too low compared to the actual value of the derivative of $h(x)$ at $x = 1.4$ ? Why?

2. Click on the box labeled "Triangle".

   a. Move point P. Describe what the triangle shows.

   b. Using what you learned about the triangle, check your answer to problem 1(b).

3. Find the derivative of $h(x)$ at the following values using the sketch to help.

   a. $x = -1$ b. $x = 2$

   c. At what values of $x$ will the derivative be zero?

   d. At what values of $x$ will the derivative be positive?

   e. At what values of $x$ will the derivative be negative?

   f. Are there any places where the derivative would not exist? Explain

Name _____ Date _____ Class # _____ Block _____

4. Using the sketch to help, find the approximate *x*-values of the points with the following derivatives, if possible.

   Note: $\frac{dy}{dx} = 1$ can be read as "dee-why, dee-ecks" and means that the slope of the line is equal to 1.

   a. $\frac{dy}{dx} = 1$ b. $\frac{dy}{dx} = 0$

   c. $\frac{dy}{dx} = \frac{9}{2}$ d. $\frac{dy}{dx} = -0.5$

   e. $\frac{dy}{dx} = -1$

5. Click the box labeled "Point D".

   a. For what values of *x* is point D below the *x*-axis?

   b. For what values of *x* is point D above the *x*-axis?

   c. For what values of *x* is point D on the x-axis?

   d. Describe the relationship of point D to the function $h(x)$.

   e. For what values of *x* are point P and point D coincident? What does this mean?

6. The function, *f*, which the graph in the dynamic worksheet represents is a polynomial.

   a. Create and equation for $f(x)$.

   b. Using your equation, create an expression for the slope of the line passing through $(2, f(2))$ and $(2+h, f(2+h))$. Simplify your expression.

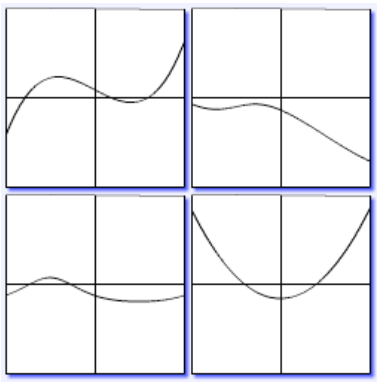
   c. Let $g(x)$ represent your function from part (a) of this problem. Evaluate $\lim_{h \to 0} g(x)$.

   d. What does your answer from part (c) represent? Confirm your answer with the dynamic worksheet.

7. Play the "Derivative Matching Game". Record your scores.

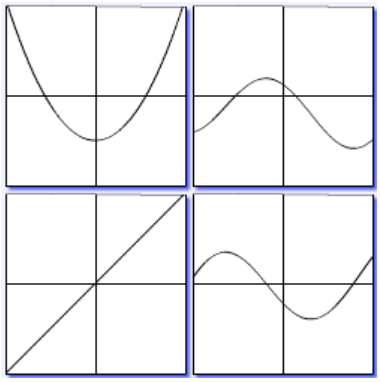
8. In each set of four graphs below, one of the graphs represents the original function and another represents the derivative function. Infer which is which. (If this is hard, then play the "Derivative Matching Game" some more!).

   a.

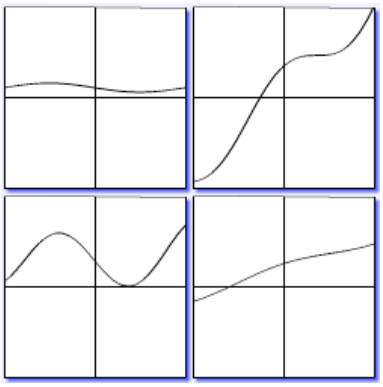


Name _____ Date _____ Class # _____ Block _____

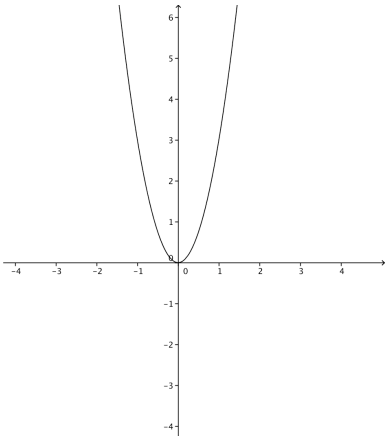
b.



c.



9. Consider the graph of the function *f* below. Answer the questions that follow in order to help you create a graph of the derivative of *f*.[1]



a. For what values of *x* will the derivative of *f* be positive?

b. For what values of *x* will the derivative of *f* be negative?

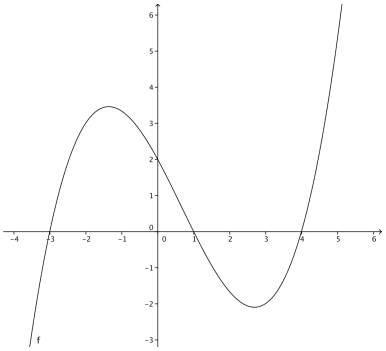
c. For what values of *x* will the derivative of *f* be zero?

d. For what values of *x* will the derivative of *f* be relatively high?

e. For what values of *x* will the derivative of *f* be relatively low?

f. Using your answers to the questions above to help, sketch a graph (on the axes above) of the derivative of the function *f*.

10. Repeat question 9 for the graph below.



[1] A good video on how to sketch the graph of a derivative function can be found at http://www.youtube.com/watch?v=QoTGPUArfTI