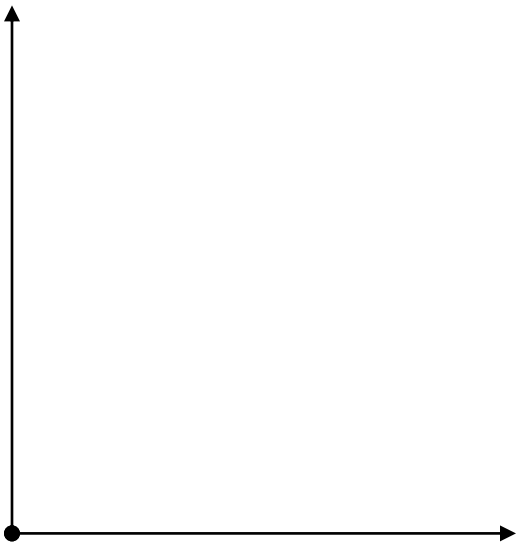
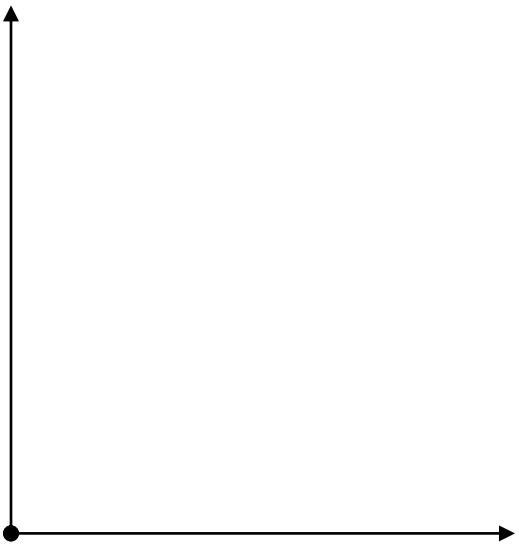
Unit 3: The Derivative

Name: _____

Understanding the Derivative as the Slope of a Tangent Line





Let's examine the slope of the tangent line for: $f(x) = x^2$ at the point (3,9).

Using the limit definition:

Using the slope formula:

The Derivative

The derivative of a function is the formula obtained by finding the:

$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

The derivative yields the formula that can be used to find the slope of the tangent line to the graph of the function at any single point on the graph.

Examples:

1. Find the derivative for $f(x)=2x^2+3$ using the limit definition.
   Use it to find the slope of the tangent line to the graph of $f(x)$ at (1,5).

2. Find the derivative for $g(x)=x^3-3x+2$ using the limit definition.
   Use it to find the slope of the tangent line to the graph of $g(x)$ at (-2,0).

NOTE: If the function is rational, you will need to find a common denominator to find the derivative.

3. Find the derivative for $f(x)=\frac{1}{x-1}$ using the limit definition.
   Use it to find the slope of the tangent line to the graph of $f(x)$ at $(-5,-\frac{1}{6})$.