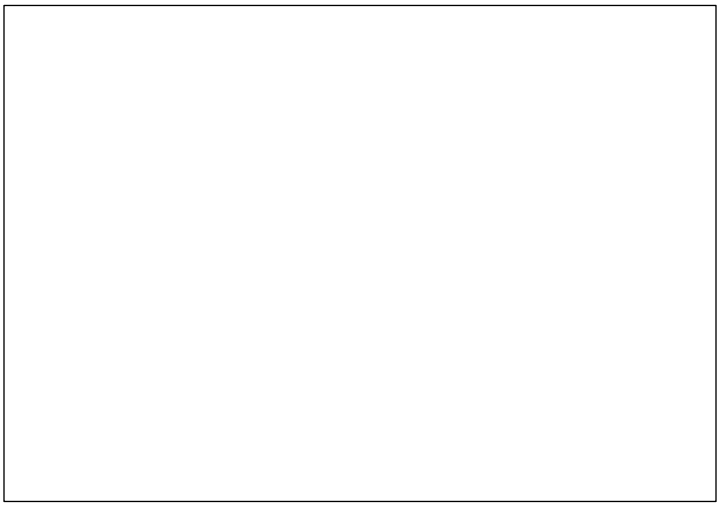
Entry #: _____

Lesson 1.4: Limit Definition of the Derivative

Any _____ has the same slope at every point. In calculus, we frequently deal with the slope of a curve.

The slope of a curve is defined to be the same as the slope of the curve's _____ at a given point.

To find the slope of a tangent line, we use a _____ of the slope of a secant line.



$$m_{sec} = \frac{\Delta y}{\Delta x} = \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

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

The slope of a tangent line is called the _____ of the function at a given x-value.

The most commonly used symbol for the derivative is $f'(x)$.

Here are some other notations you will encounter. (Assume $y = f(x)$)

$$f'(x) = y' = \frac{dy}{dx} = \frac{d}{dx}f(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

A _____ has no slope, so a curve has no derivative at any point where it has a vertical tangent line.

_____ is the process of finding derivatives. If a derivative exists at a point on a curve, the function is said to be **differentiable**.

Examples:

1. If $f(x) = x^2 + 2$

   a. Find $f'(x)$.

   $f'(x) = \lim_{\Delta x \to 0}$ _____

   b. Use your answer from part a to find: $f'(-3)$.

2. If $y = \sqrt{x}$, find y'.

   $y' =$

3. Given $y = f(t) = \frac{2}{t}$

   Find the derivative of y **with respect to *t***.

   $\frac{dy}{dx} = f'(t) =$