

Unit #6: Continuity

Topic: Definition of a Derivative

Objective: SWBAT find the derivative of a function by using the formal definition of the derivative.

Warm Up #4:

Find the slope of the curve $y = \frac{1}{x+1}$ at the point $(2, \frac{1}{3})$. Then, write an equation for the line that is tangent to the curve at this point.

What is the Derivative?

The limit used to define the slope of a tangent line is also used to define one of the two fundamental operations of calculus called _____.

Definition:

The _____ of the function f with respect to the variable x is the function _____ whose value at x is

The derivative is the formula which gives the slope of the tangent line at any point x for $f(x)$.

Other notations besides $f'(x)$ include:

Applying the definition:

Example #1: Find the derivative of $f(x) = x^3 + 1$.

What is the slope of the graph at the points $(-1,0)$ and $(2,9)$?

Example #2: Find $\frac{dy}{dx}$ for $y = \sqrt{x}$ and use the result to find the slope of the graph of y at the points $(1,1)$ & $(4,2)$.

What happens at the point $(0,0)$?

Problem Set #4: For each of the following (a) Find the derivative formula. (b) Find the value of the derivative at the indicated point. (c) Identify any values of x for which the derivative would not exist.

1) $y = \frac{2}{x}; (-2, -1)$

2) $f(x) = 3 - x^2; (0, 3)$

3) $g(x) = \sqrt{x + 1}; x = 3$

$$4) y = 4x^2 ; (-1,4)$$

$$5) h(x) = \frac{x^2}{4} ; x = -4$$

$$6) y = \frac{1}{x+2} ; \left(3, \frac{1}{5}\right)$$

Answer Key to part (b): 1) $-\frac{1}{2}$ 2) 0 3) $\frac{1}{4}$ 4) -8 5) -2 6) $-\frac{1}{25}$