



# What is a Derivative?

*Worksheet with Answer Key*

## Relevant urls:

- 1) What is Derivative? [www.mathscoop.com/calculus/derivatives/what-is-a-derivative.php](http://www.mathscoop.com/calculus/derivatives/what-is-a-derivative.php)
- 2) Derivatives : [www.mathscoop.com/calculus/derivatives/](http://www.mathscoop.com/calculus/derivatives/)
- 3) What is Calculus? [www.mathscoop.com/calculus/what-is-calculus.php](http://www.mathscoop.com/calculus/what-is-calculus.php)

*More Worksheets can be found at*

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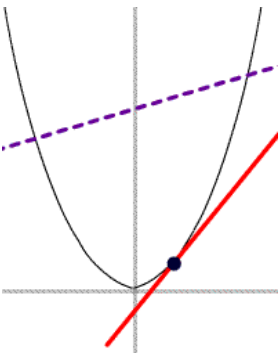
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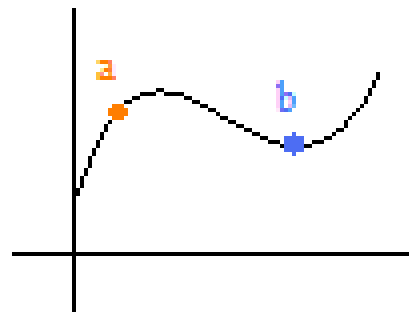
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**Free Online Graphing Calculator:** [www.meta-calculator.com/online/](http://www.meta-calculator.com/online/)

- 1) The line connecting two points  $(a, f(a))$  and  $(b, f(b))$  on a curve is known as the \_\_\_\_\_ line.
  
- 2) As “b” approaches “a”, the slope of the secant line approaches the slope of the \_\_\_\_\_ line.
  
- 3) The derivative of a function also known as the \_\_\_\_\_ and the \_\_\_\_\_
  
- 4) The slope of the secant line tells you the \_\_\_\_\_ rate of change and the slope of the tangent line tells you the \_\_\_\_\_ rate of change.
  
- 5)

<p>Insert a picture of a graph with a tangent and a secant line</p> 	<p>The tangent line is the _____ line</p> <p>The secant line is the _____ line</p>
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- 6) Sketch the secant line between the point a and point b. On the same graph below sketch the tangent line at point a.



7) Find the average rate of change between the points  $(-1,6)$  and  $(5,3)$

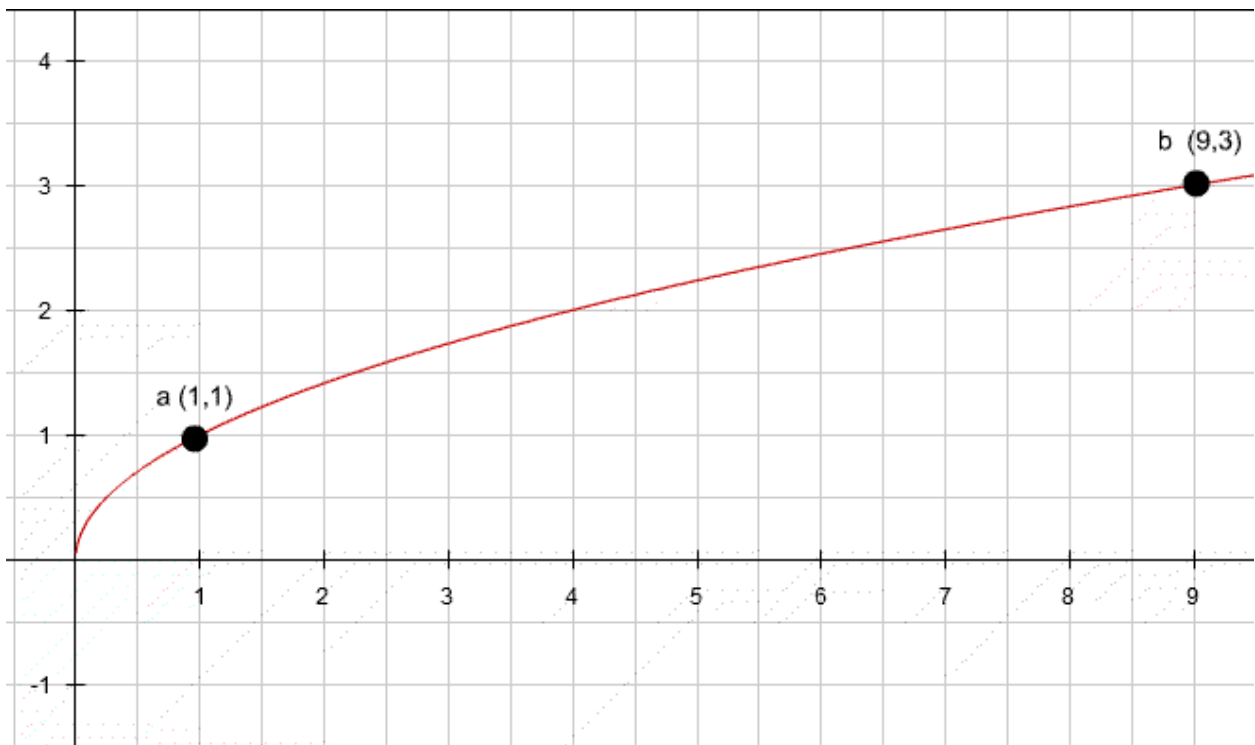
8)

a) Find the equation of the secant line between point a and point b in the graph below.

Slope:

Equation:

Sketch the secant line on the graph



9) Sketch the graph of  $f(x) = (x - 1)^2 + 2$ .

$f(x) = (x - 1)^2 + 2$	Plot the point $x = -1$ and label it "a" Plot the point $x = 1$ and label it "b"
	a) Find the equation of the secant line between points "a" and points "b"  Slope:  Equation:  b) Sketch the secant line on the graph

10) Given function  $y = x^3$ , and the point  $(-1, -1)$ . Starting with the given point which x-value will produce a secant line with the greatest rate of change.

a)  $x = 1$

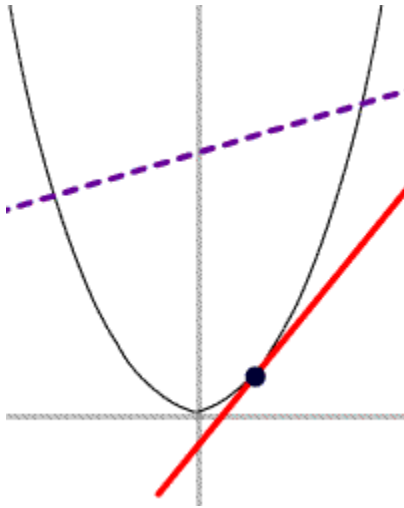
b)  $x = 0$

c)  $x = -2$

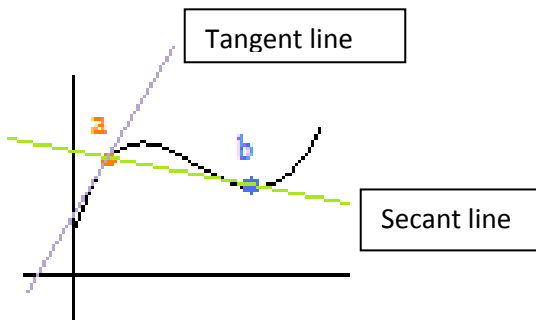
d)  $x = 2$

**Answer Key :**

- 1) Secant
- 2) Tangent
- 3) Instantaneous rate of change , slope of the tangent line
- 4) Average, instantaneous
- 5) Red solid line = tangent, purple dashed line is the secant

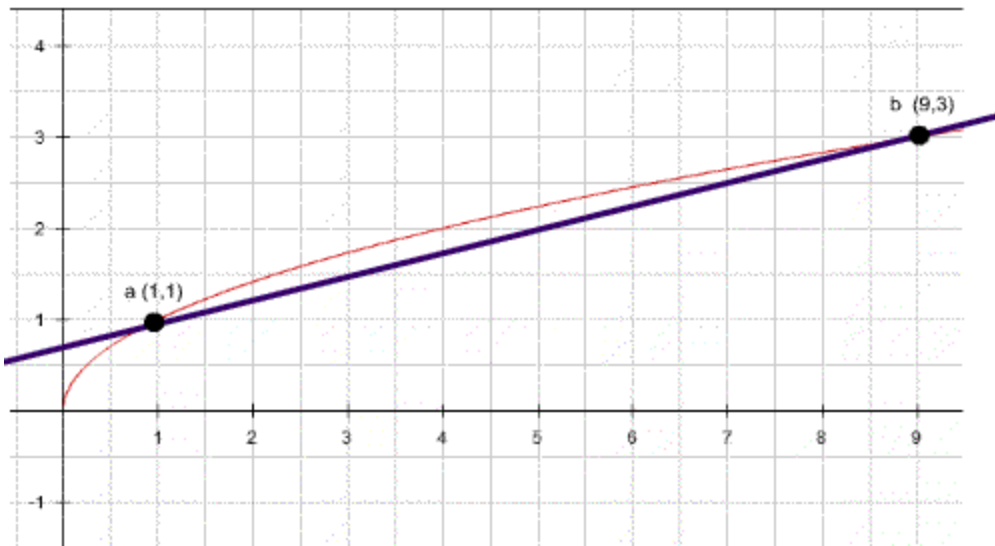


6)

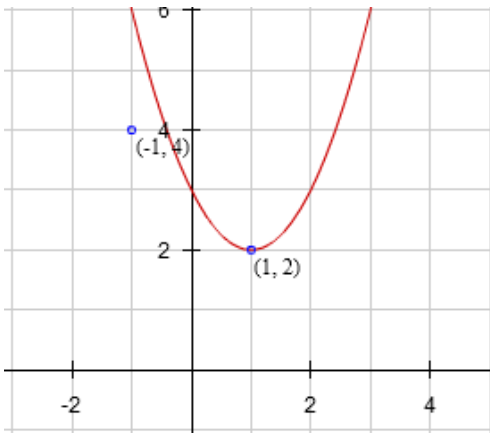


$$7) \frac{\Delta y}{\Delta x} = \frac{3-6}{5-(-1)} = \frac{-3}{6} = -\frac{1}{2}$$

8) Slope:  $\frac{\Delta y}{\Delta x} = \frac{3-1}{9-1} = \frac{2}{8} = \frac{1}{4}$       Equation:  $(y - 1) = \frac{1}{4}(x - 1)$  or  $y = \frac{1}{4}x + \frac{3}{4}$



9) Point a (-1,4)    Point b (1,2)



Slope:  $\frac{\Delta y}{\Delta x} = \frac{2-4}{1-(-1)} = \frac{-2}{2} = -1$       Equation:  $(y - 2) = -1(x - 1)$  or  $y = -x + 3$

10) Choice d

Choice a (1,1) Given point (-1,-1)	Slope: $\frac{\Delta y}{\Delta x} = \frac{1-(-1)}{1-(-1)} = \frac{2}{2} = 1$	
Choice b (0,0) Given point (-1,-1)	Slope: $\frac{\Delta y}{\Delta x} = \frac{0-(-1)}{0-(-1)} = \frac{1}{1} = 1$	
Choice c (-2,8) Given point (-1,-1)	Slope: $\frac{\Delta y}{\Delta x} = \frac{8-(-1)}{-2-(-1)} = \frac{9}{-1} = -9$	
Choice d (2,8) Given point (-1,-1)	Slope: $\frac{\Delta y}{\Delta x} = \frac{8-(-1)}{2-(-1)} = \frac{9}{3} = 3$	This is the greatest slope and thus greatest rate of change.