Secants to Tangents

A **secant** is a line that intersects a curve _____

_____.

A **tangent** is a line that most resembles the curve near that point. It

_____ but does not _____ the curve near that point.

1. Find the slope of the tangent line to the parabola $y = x^2$ at the point P(3,9).

   a) Let Q be a point on $y = x^2$ close to P

$m_{PQ} =$

NOTE: A tangent line has only ONE ordered pair. We need TWO ordered pairs to use the formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

b) Let's try another point even closer to P…

$m_{PQ} =$

c) Let's try another point close to P, on the other side:

$m_{PQ} =$

d) Estimate the value of the slope of tangent at x = 3. Justify your answer:

In general, let Q be a point on $y = x^2$ close to P.

The coordinates for Q are:

The slope of the secant PQ is given by:

NOTE: Point Q cannot be exactly point P, or

$m = \frac{0}{0}$!

But the closer Q is to P, the more accurate our tangent slope calculation is.

New notation:

"The limiting value as h approaches 0 of the function f(x)" is written as:

The slope of the tangent line at point P is the slope of the secant line PQ as Q moves closer and closer to P.

$m_{tangent} =$

So, the slope of the tangent at x = 3 on the graph $y = x^2$ is:

m =

(because as $h \to 0$, then $6 + h \to$, _____)