

Demonstration 1: Equation of tangent line - Secant method
MATH 251, CALCULUS I, SPRING 2014

Recall the *tangent line problem discussed in class*:

Find the equation of the tangent line to $y = x^2$ at the point $(1, 1)$

We solved this problem using the **Secant method** in the following way:

1. We picked a point Q that lies on the curve $y = x^2$. The coordinates of $Q = (x, x^2)$.
2. We used a sequence of secant lines \overline{PQ} with points Q moving closer to P to approximate the slope of the tangent line.
3. We did this for points Q that are to the left and right of P .
4. In doing so we recognized that we had actually computed our first limit

$$\lim_{x \rightarrow 2} \frac{x^2 - 1}{x - 1} = 2$$

The attached plot is a graphical demonstration of the **secant method** outlined above. As you move the slider for the variable a you can see that the slope of the secant line approaches the slope of the tangent line from the left. Similarly as you move the slider for b you notice that the slope of the secant line approaches the slope of the tangent line.