In this worksheet, you will use slopes of secant lines to estimate the slope of a tangent line.

In the following problems, let $f(x) = x^2$.

1. Sketch a careful graph of the curve $y = f(x)$ on the interval $0 \leq x \leq 2$. (You may check your graph with a calculator if you wish.)

2. On top of the curve you graphed above, graph the secant line through the points $(1, f(1))$ and $(2, f(2))$. Also, compute the slope of this line.
3 On top of the curve you graphed in part 1, graph the secant line through the points (1, f(1)) and (1.5, f(1.5)). Compute the slope of this line.

4 Calculate the slope of the line through the points (1, f(1)) and (1 + s, f(1 + s)). (The slopes you calculated in parts 2 and 3 above correspond to taking s = 1 and s = 0.5, respectively. You should convince yourself of this before continuing.)

5 On top of your graph in part 1, graph a tangent line to the curve at the point (1, f(1)). (Notice that as s gets smaller in part 4, the corresponding line gets closer to the tangent line.)
6] Calculate the slope in part 4 for several small values of \( s \) (such as 0.1, 0.01 and 0.001) to guess the slope of the tangent line. (You may wish to use a calculator here.)

7] Use a process similar to the first six problems to guess the slope of a tangent line to the graph of \( y = f(x) \) at the point \((2, f(2))\).