Math 1110: **Derivatives** Pre-class for Sept 14 (Fri)

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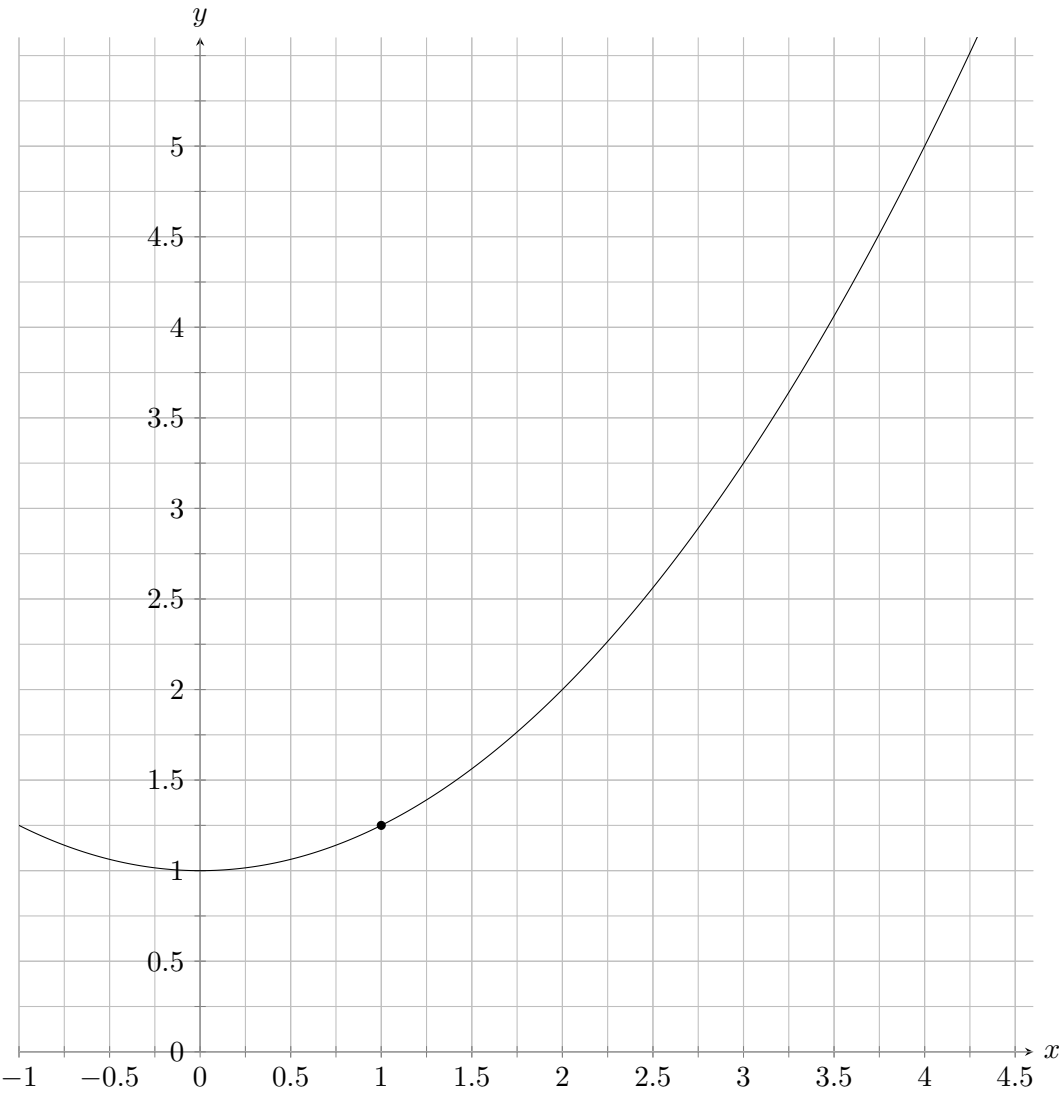
The goal of this exercise is to see how we can determine the slope of the tangent line to a function at a given point.

For this exercise, we consider a function $f(x)$ and we are looking for the slope of its tangent line at the point $x_0 = 1$. To do so, we will look at secant lines that pass through the point $(x_0, f(x_0)) = (1, f(1))$ on the function.

1. Draw each of the lines below and estimate their slopes using the grid pattern of the graph.
   (a) The line that passes through $(1, f(1))$ and $(4, f(4))$,
   (b) The line that passes through $(1, f(1))$ and $(3, f(3))$,
   (c) The line that passes through $(1, f(1))$ and $(2, f(2))$,
   (d) The line that passes through $(1, f(1))$ and $(1.5, f(1.5))$,



2. Draw the tangent line to the function $f(x)$ at x_0.

3. Which of the secant lines you have drawn is the closest to the actual tangent line at x_0? How could you improve this process of approximating the tangent line further?

4. Let us now look at the secant line that passes through $(1, f(1))$ and $(4, f(4))$.

   (a) What is its slope?

   (b) Rewrite the formula of the slope using only $1, f(1), 4$, and $f(4))$.

   (c) Rewrite the formula of the slope using only $x_0, f(x_0), 4$, and $f(4))$.

5. For the line that passes through $(1, f(1))$ and $(2, f(2))$, write the formula of the slope using only $x_0, f(x_0), 2$, and $f(2))$.