Math 161 **Summer 2015**
Quiz 2 **Drew Armstrong**

No calculators are allowed on this quiz.

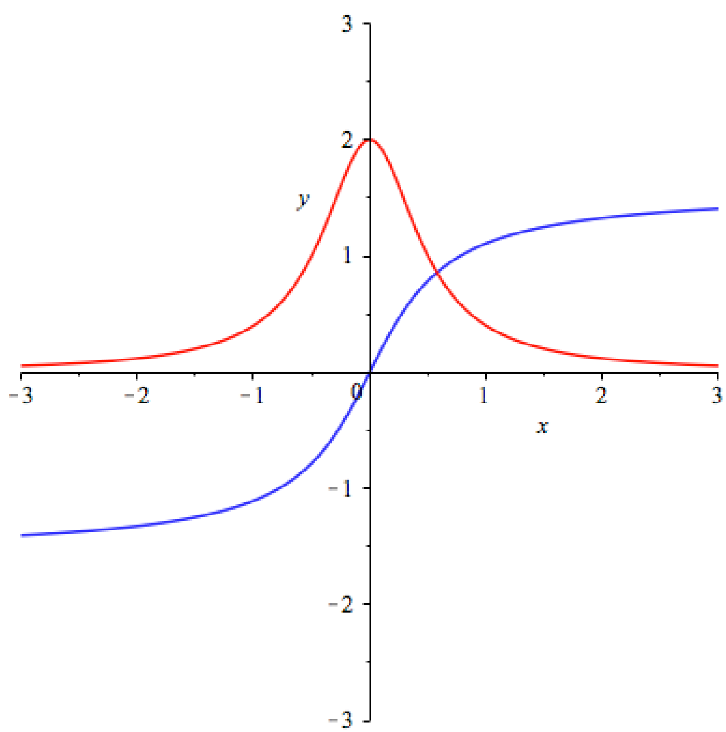
1. Let $f(x)$ be a function. **State the definition** of the derivative function $f'(x)$. [Hint: No words are necessary, just use symbols.]

There are many equivalent ways to state the definition. Here is one way:

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}.$$

2. The following picture shows the graph of a function $f(x)$. **Sketch** the graph of the derivative $f'(x)$ on the same axes.

Here is the function $f(x)$ (in blue) with its derivative $f'(x)$ (in red).



3. Given $f(x) = x^3 - 2x + 1$, compute $f'(x)$.

We use the basic derivative rules and the power rule to compute

$$\begin{aligned} f'(x) &= (x^3 - 2x + 1)' \\ &= (x^3)' - 2(x)' + (1)' \\ &= (3x^2) - 2(1) + (0) \\ &= 3x^2 - 2. \end{aligned}$$

4. Given $y = \dfrac{\sin\theta}{2} + \dfrac{c}{\theta}$, compute $\dfrac{dy}{d\theta}$.

First we write $y = \frac{1}{2}\sin\theta + c\,\theta^{-1}$. Then we compute

$$\begin{aligned} \frac{dy}{d\theta} &= \frac{1}{2}\cos\theta + c\,(-1)\theta^{-2} \\ &= \frac{\cos\theta}{2} - \frac{c}{\theta^2}. \end{aligned}$$

5. Given $g(u) = u \cdot \sin(u)$, compute $g'(u)$.

We use the product rule to compute

$$\begin{aligned} g'(u) &= (u)' \cdot \sin(u) + u \cdot (\sin(u))' \\ &= 1 \cdot \sin(u) + u \cdot \cos(u) \\ &= \sin(u) + u \cdot \cos(u). \end{aligned}$$