Math 263A **Guide for Test 2**

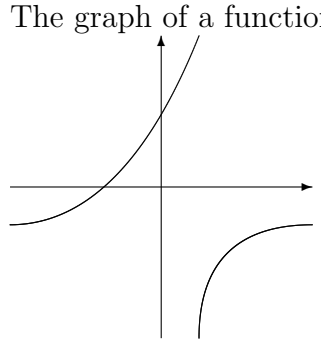
Here are some sample questions from sections 2.1–2.5. Some topics that we covered are not represented by these questions, but are still fair game.

1. Let $f(x) = -x^2 + 3$.
   (a) Using the definition of the derivative as a limit, compute $f'(x)$.
   (b) Find the equation for the tangent line at $x = 2$.
   (c) Graph $f(x)$ and the tangent line.

2. Find values for m and b so that $f(x) = \begin{cases} x^2 & \text{if } x \leq -2 \\ mx + b & \text{if } x > -2 \end{cases}$ is differentiable at $x = -2$.

3. Sketch the graph of a function g for which $g(0) = g'(0) = 0$, $g'(-1) = -1$, $g'(1) = 3$, and $g'(2) = 1$.

4. The graph of a function f is given below. On the same axes, sketch the graph of f'.



5. Compute the following derivatives:
   (a) $f(x) = 2 + x + \dfrac{3}{x} - \sqrt{x} - 5x^7 + x^{3/4} \Rightarrow f'(x) =$
   (b) $D_x\left[(x^9 + x^8 + x^5 + 3)(1 + 2x^2 + 9x^3 - 4x^4)\right] =$
   (c) $y = \dfrac{x^3 + x}{x} \Rightarrow \dfrac{dy}{dx} =$
   (d) $\dfrac{d}{dx}\left[(x^9 + 2x^{1/3} + x^5 + 3)^4\right] =$
   (e) $y = (3 + x^4)^8 x^3 \Rightarrow \dfrac{dy}{dx} =$
   (f) $\dfrac{d}{dx}\left[5\tan(x^2 \sin(x^3 + 7x))\right] =$
   (g) $D_x\left[\left((x^9 + x^8 + x^5 + 3)(1 + 2x^2 + x^3 - 4x^4) + 1\right)^9\right] =$
   (h) $f(x) = \sin(3) \Rightarrow f'(x) =$