Math 163A **Guide for Test 2**

Here are some sample questions from old tests. Some topics that we covered are not represented by these questions, but are still fair game.

1. Compute the following limits:

   (a) $\lim_{x\to 2} \dfrac{x-2}{x^2-5x+6}$

   (b) $\lim_{h\to 0} \dfrac{x^2-(x-2h)^2}{h}$

   (c) $\lim_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$

   (d) $\lim_{x\to -\infty} \dfrac{3x^3-4}{2x^3-2}$

2. 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.

3. Consider the function

$$f(x) = \begin{cases} x^2 & \text{if } x \le -2 \\ Ax & \text{if } x > -2 \end{cases},$$

   where A is some constant.

   (a) Find $\lim_{x\to -2^-} f(x)$. Is f continuous from the left at $x = -2$?

   (b) What value of A would make f continuous at $x = -2$?

   (c) Using the value of A that you just found, graph f.

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