

**Math 163A A01 Fall 2009****Guide for Test 2**

Here are some sample questions from Sections 3-1, 3-2, 3-3, and 3-4. Some topics that we covered are not represented by these questions, but are still fair game.

1. Compute the following limits:

$$(a) \lim_{x \rightarrow 2^+} \frac{x - 2}{x^2 - 5x + 6}$$

$$(b) \lim_{h \rightarrow 0} \frac{x^2 - (x - 2h)^2}{h}$$

$$(c) \lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$$

$$(d) \lim_{h \rightarrow 0} \frac{1}{h} \left( \frac{1}{1+h} - 1 \right)$$

$$(e) \lim_{x \rightarrow -\infty} \frac{3x^3 - 4}{2x^3 - 2}$$

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

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

where  $A$  is some constant.

- (a) Find  $\lim_{x \rightarrow -2^-} f(x)$ . 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, is  $f$  differentiable?
- (d) Using the value of  $A$  that you just found, graph  $f$ .