

**Math 163A****Guide for Test 4**

Here are some sample questions from Sections 5.4, 6.1, and 6.2. Some topics that we covered are not represented by these questions, but are still fair game.

1. Sketch the graph of a single function that has all of the following properties:
  - (a) Continuous and differentiable everywhere except at  $x = -3$ , where it has a vertical asymptote.
  - (b) A horizontal asymptote at  $y = 1$ .
  - (c) An  $x$ -intercept at  $x = -2$ .
  - (d) A  $y$ -intercept at  $y = 4$ .
  - (e)  $f'(x) > 0$  on the intervals  $(-\infty, -3)$  and  $(-3, 2)$ .
  - (f)  $f'(x) < 0$  on the interval  $(2, \infty)$ .
  - (g)  $f''(x) > 0$  on the intervals  $(-\infty, -3)$  and  $(4, \infty)$ .
  - (h)  $f''(x) < 0$  on the interval  $(-3, 4)$ .
  - (i)  $f'(2) = 0$ .
  - (j) An inflection point at  $(4, 3)$ .
2. Analyze and graph the function  $f(x) = x + \frac{9}{x}$ .
3. Find the absolute maximum and minimum of the function  $f(x) = 2x^3 - 3x^2 - 12x + 5$  on the interval  $[-2, 0]$ .
4. A company wishes to manufacture a box with a volume of  $6 \text{ m}^3$  that is open on top and has a square base. The material for the bottom of the box costs \$3 per  $\text{m}^2$ , while the material for the sides costs \$2 per  $\text{m}^2$ . Find the dimensions of the box that will lead to minimum total cost. What is the minimum total cost?