MATH 120 MIDTERM 1 INFORMATION

The midterm will cover Sections 1.1-1.5 and 2.1-2.4 of the textbook. There will be 4-5 problems whose level of difficulty will be comparable to that of the practice problems below. You will not be allowed to use books, notes, or calculators.

Please read Sections 2.1 – 2.4 of the textbook before the midterm (you may skip the proof of the Chain Rule in Section 2.4). There will be no homework on Sections 2.1 – 2.4 before the test. Accordingly, the midterm questions on that part of the material will be less challenging. Recommended practice problems are: Section 2.1, 1–24; Section 2.2, 1–49; Section 2.3, 1–50; Section 2.4, 1–16 and 22–32.

PRACTICE PROBLEMS

1. Evaluate the following limits if they exist; if they do not exist, explain why.

   (a)
   $$\lim_{x \to \infty} \frac{x^2 - \cos(2x)}{x - x^2 + \sqrt{x}},$$

   (b)
   $$\lim_{x \to 3} \frac{|x^2 - 4x + 3|}{x^2 - 9}.$$

2. (a) Find $\frac{d}{dx}\left(\frac{2x+1}{\sqrt{x^2+1}}\right)$.

   (b) If $f(x)$ is is a function differentiable at $x = 0$ and if $g(x) = f(x^3)$, what is $g'(0)$?

3. Find all values of k such that the line $y = 4x - 6$ is tangent to the graph of the function $y = kx^2$.

4. We know that $f(x)$ is a continuous function on $[0, 1]$ such that $f(0) > 0$ and $f(1) < 1$. Prove that there is a c in $(0, 1)$ such that $f(c) = c$. (Hint: apply the Intermediate Value Theorem to the function $g(x) = f(x) - x$.)