Math 111 – Fall 2014
Examination 3

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(15 pts.) Find the most general antiderivative for the following:

a. $f(x) = \sin(2x) - e^{3x}$

b. $f(x) = \left(1 + \dfrac{1}{\sqrt{x}}\right)^2$

c. $f(x) = x^{\sqrt{2}} + \dfrac{1}{x^{\sqrt{2}}}$

2.(7 pts.) Find the linearization of $f(x) = \tan^2(x)$ about $a = \frac{\pi}{3}$.

3.(7 pts.) Use Newton's method to approximate a zero of $f(x) = x^5 - x - 1$. Start with $x_0 = 0$ and find x_2.

4.(15 pts.) Evaluate the following limits:

a. $\lim\limits_{x\to\infty} \left(\ln(2x^2+1) - 2\ln(x)\right)$

b. $\lim\limits_{x\to 0^+} x\,(\ln(x))^2$

c. $\lim\limits_{x\to 0^+} x^{\sqrt{x}}$

5.(12 pts.) Find the absolute maximum and absolute minimum values of each function on the given interval.

a. $y = x^3 + 3x^2 - 9x + 1, \qquad 0 \le x \le 2$

b. $y = \sin(x) + \cos(x), \qquad 0 \le x \le \dfrac{\pi}{2}$

6.(8 pts.) A rectangular poster is to be printed on a piece of paper having an area of 240 in^2. The printed area of the poster has a 2 inch margin at the top and a 1 inch margin at each side as well as the bottom. What dimensions of the poster give the largest printed area? Show that your result is a maximum.

7.(16 pts.) Consider the function $y = x^{\frac{4}{3}} - 4x^{\frac{1}{3}}$.

a. Find the intervals on which this function is increasing or decreasing.

b. Find the intervals on which this function is concave up or concave down.

c. Determine the points at which this function has a local maximum, a local minimum, or a point of inflection.

d. Sketch a graph of this function making sure to label the points found in part **c**.

8.(20 pts.) Consider the function $y = \dfrac{x^3 + 4}{x^2}$.

a. Find all asymptotes of this function.

b. Find the intervals on which this function is increasing or decreasing.

c. Find the intervals on which this function is concave up or concave down.

d. Determine the points at which this function has a local maximum, a local minimum, or a point of inflection.

e. Sketch a graph of this function making sure to label the asymptotes from part **a** and the points found in part **d**.