Math 221 Calculus 2 Midterm Exam 2
Professor John Maginnis October 22, 2013

Your name: _____

Rec. Instr.: _____ Rec. Time: _____

Show all your work in the space provided under each question. Please write neatly and present your answers in an organized way. You may use your one sheet of notes, but no books or calculators. This exam is worth 60 points. The chart below indicates how many points each problem is worth.

Problem	1	2	3	4
Points	/10	/10	/10	/10
Problem	5	6		Total
Points	/10	/10		/60

1. Find the arc length of the curve $y = 2x\sqrt{x} = 2x^{\frac{3}{2}}$ for $0 \leq x \leq 7$.

2. Find the centroid of the region under the curve $y = \sin(x)$ for $0 \leq x \leq \pi$.

3. (a) Find the limit of the sequence $a_n = n^2(1 - \cos(\frac{1}{n})) = \frac{1-\cos(\frac{1}{n})}{\frac{1}{n^2}}$.

(b) Determine whether the series converges. Explain.

$$\sum_{n=1}^{\infty} n^2(1-\cos(\frac{1}{n}))$$

(c) Find the sum of the series.

$$\sum_{n=0}^{\infty} \frac{2^{n+2} - 3^n}{5^{n+1}}$$

4. Approximate $\sqrt{1.04}$ as follows.

   (a) Find the second Taylor polynomial $T_2(x)$ for $f(x) = \sqrt{x}$ at $a = 1$.

   (b) Evaluate $T_2(1.04)$.

   (c) Estimate the error using the formula $K\frac{|x-a|^{n+1}}{(n+1)!}$.

5. A tank full of water has the shape of a cone of height 10 meters, and the radius at the top of the tank is 6 meters. Find the work done in pumping out the water through a spout which is 5 meters above the top of the tank. Write your final answer in terms of g and ρ. Do <u>not</u> plug in $g = 9.8\frac{m}{sec^2}$ and $\rho = 1000\frac{kg}{m^3}$.

6. Find the volume of revolution formed by revolving the region under the curve $y = \frac{4}{4-x^2}$ for $0 \leq x \leq 1$ around the line $x = 1$.