Math 221 FINAL EXAM

July 28, 2017

Student's Name:

Instructor's Name:

Q.N.	1	2	3	4	5	Total
Points	/25	/25	/20	/25	/25	/120

Show all work in detail for full credit. No books and calculators are permitted. Use the back page as a sketch paper.

1.

(a) (10 points) Evaluate $\int cos^3x\, sin^2x\, dx$

(b) (15 points) Evaluate $\int_0^3 \frac{1}{\sqrt{3-x}}\, dx$, if possible. State whether the integral converges or diverges.

2.

(a) (10 points). Define R as the region bounded above by the graph of $f(x) = 3x - x^2$ and below by the x-axis over the interval [0, 2]. Find the volume of the solid of revolution formed by revolving R around the y-axis.

(b) (15 points) Let $f(x) = \sqrt{1-x}$ over the interval $[0, 1/2]$. Find the surface area of the surface generated by revolving the graph of $f(x)$ around the x-axis.

3.

(a) (10 points). Suppose it takes a force of 8 N to stretch a spring 6 inch from the equilibrium position. How much work is done to stretch the spring 1 ft from the equilibrium position?

(b) (15 points). Test whether the following two series converges or diverges.

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

4 (20 points). Use the series for $f(x) = \frac{1}{1-x}$ on $|x| < 1$ to construct a series for

$$\frac{1}{(1-x)(3+x)}.$$

Determine the interval of convergence.

5.

(a) (15 points). Find the fourth degree Taylor polynomials for $f(x) = \sqrt{x}$ at $x = 1$. Use this polynomial to estimate $\sqrt{6}$ and bound the error.

(b) (10 points). Rewrite the following polar equation into rectangular coordinates and sketch the graph. Also identity the symmetry of this graph.

$$r = 4sin\theta$$