Final Exam – December 9
Math 250

Fall 2014

Problem	Possible	Earned
1	40	
2	20	
3	18	
4	40	
5	14	
6	20	
7	12	
8	12	
9	12	
10	12	
Total	200	

Name: _____

Instructor: _____

Section: _____

Please check to make sure that your copy of the examination has one cover sheet and all twelve (12) pages with problems numbered 1 through 10.

Work in a neat and well-organized manner. Show your work on all problems. Full credit will not be given unless your work is clearly shown.

Only an approved (TI-30) scientific calculator will be permitted on the final examination for this course; however, calculators or computers with graphic, word-processing, symbolic manipulation or programming capabilities will not be allowed for this exam. The use of books, notes or other resource materials will not be permitted on the final examination.

All cell phones and electronic devices are PROHIBITED during the final exam.

[40] 1. Evaluate the following integrals.

a) $\int \sin^2 x \cos^3 x \, dx$

b) $\int \frac{5x^2}{(x^2+1)(2x-1)} \, dx$

c) $\int \frac{dx}{(1-x^2)^{3/2}}$

d) $\int_0^{\pi/3} x^2 \sin x \, dx$

[20] 2. Evaluate the integrals or conclude that they diverge. Please explain.

a) $\int_1^5 \frac{dx}{x-2}$

b) $\int_1^\infty \frac{dx}{3+x^2}$

[18] 3. Evaluate the following limits.

a) $\lim_{x\to 0} \dfrac{x-\sin x}{x^3}$

b) $\lim_{x\to\infty} \left(1-\dfrac{3}{x}\right)^{2x}$

[40] 4. Determine whether each series is absolutely convergent, conditionally convergent, or divergent. Name the tests that you are using and show all work.

a) $\sum_{n=1}^{\infty} \frac{1}{n+\sin n}$

b) $\sum_{n=2}^{\infty} \left(\frac{2n^3+n}{2n-n^3} \right)^n$

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

d) $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n^2+1}}$

[14] 5. Find the interval of convergence for the power series. Be sure to check the end points.

$$\sum_{n=1}^{\infty} \frac{(2x+1)^n}{(3^n)n}$$

[20] 6. a) Find the Maclaurin series of the function.

$$f(x) = \sin(5x)$$

b) Find the Maclaurin series of the function. Write your answer in the form $c_0 + \sum_{n=1}^{\infty} c_n x^n$.

Clearly indicate what are coefficients c_n.

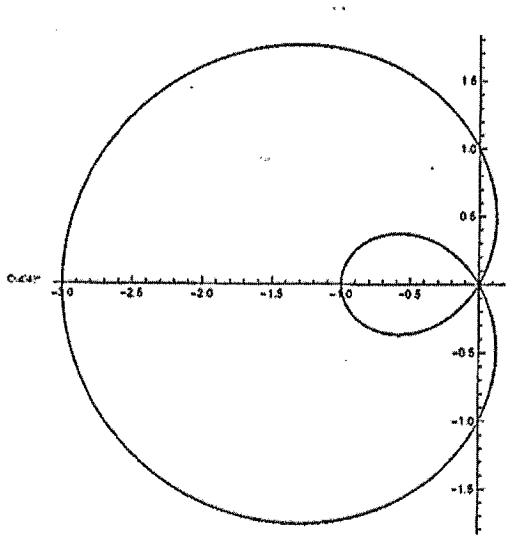
$$f(x) = (x+3)e^{2x}$$

[12] 7. Find the first four terms in the Taylor series for the function centered at $a = 1$.

$$f(x) = 1 + \ln(2x - 1)$$

[12] 8. The graph of the polar curve $r = 1 - 2\cos\theta$ is given below.

a) Plot points on the graph corresponding to the given values of Θ.



$r = 1 - 2\cos\theta$

A $\theta = 0$

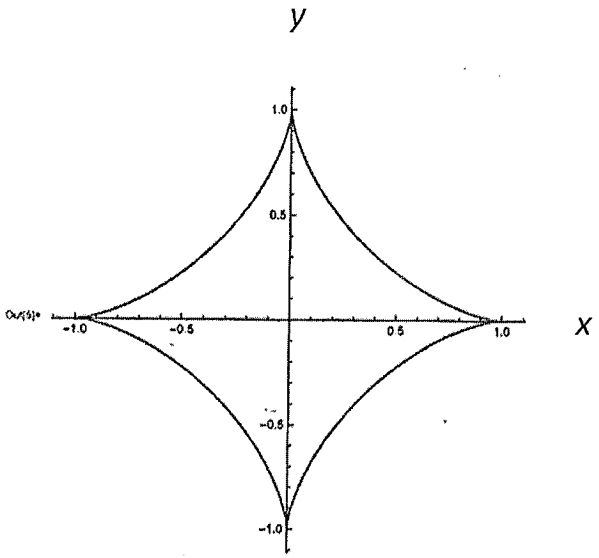
B $\theta = \frac{\pi}{3}$

C $\theta = \frac{\pi}{2}$

D $\theta = \pi$

b) Set up, but do not evaluate, an integral that gives the length of the larger loop.

[12] 9. The astroid



has parametric equations $x = \cos^3 t, \quad y = \sin^3 t.$

Find the arc length of the curve for $0 \le t \le \frac{\pi}{2}$.

[12] 10. Find the area of the region that is inside the cardioid $r = 2 + 2\sin(\theta)$ and outside the circle $r = 3$.