Math 182 , Fall 2006 **Section:** ________ **Name:** ______________________________

Final Exam : Tuesday, December 12, 2006.

Problem	1	2	3	4	5	6	7	8	9	10	Total
Value	10	10	10	10	10	10	10	10	10	10	100
Points											

Instructions : All work must be shown to receive full credit.

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1. [10pts] Determine the first three terms of the Taylor Series of $f(x) = \sqrt{3+x}$ about $a = 1$.

2. [10pts] Use integration by parts to evaluate the following integral:

$$I = \int x \, e^{3x} \, dx$$

3. [10pts] In the left column below are equations of curves defined using polar coordinates (r, θ). In the right column are graphs of various curves. Match the letter of each graph to its appropriate equation in the left column.

______ $\theta = \frac{\pi}{4}$

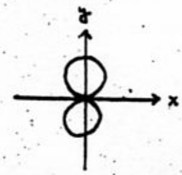
______ $r = 2$

______ $r = \frac{1}{\sin(\theta)}$

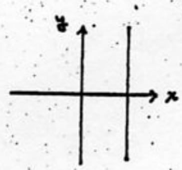
______ $r = 2\cos(\theta)$

______ $r = \cos(2\theta)$

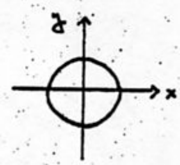
a)



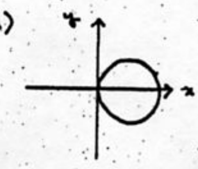
b)



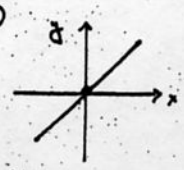
c)



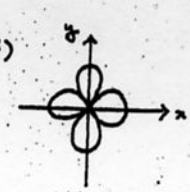
d)



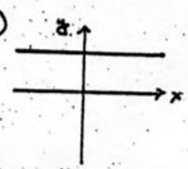
e)



f)



g)



4. [10pts] Evaluate the following definite integral (Hint: first expand the integrand out)

$$I = \int_0^{2\pi} (1 + cos(x))^2 \ dx$$

5. [10pts] Use the inverse substitution $x = 3 \ sec(\theta)$ to evaluate

$$I = \int \frac{dx}{x^2\sqrt{x^2 - 9}}$$

6. [10pts] Use partial fraction expansions to evaluate

$$I = \int \frac{3}{(x+2)(x-1)}\ dx$$

7. [10pts] Determine the radius of convergence R of the following power series

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

8. [10pts] Use the Limit Comparison Test to determine if the following series converges or diverges.

$$S = \sum_{n=0}^{\infty} \frac{5^n}{3^n + 4^n}$$

9. [10pts] Use any method to determine if the following series converges or diverges. State and verify all hypotheses of the theorem you used.

$$S = \sum_{n=3}^{\infty} \frac{(-1)^{n+1}}{n\ ln(n)}$$

10. [10pts] Use the Comparison Test to determine if the following series converges or diverges.

$$S = \sum_{n=3}^{\infty} \frac{sin(n) + 2}{ln(n)}$$

Indefinite integrals and Trigonometric Identities

Some trigonometric identities which may or may not be needed include:

$$\begin{aligned}
cos^2(x) &= \frac{1}{2}\left(1 + cos(2x)\right) \\
sin^2(x) &= \frac{1}{2}\left(1 - cos(2x)\right) \\
sin(2x) &= 2\ sin(x)\ cos(x) \\
sin(x)\ cos(y) &= \frac{1}{2}\left(sin(x+y) + sin(x-y)\right) \\
cos(x)\ cos(y) &= \frac{1}{2}\left(cos(x+y) + cos(x-y)\right) \\
sin(x)\ sin(y) &= \frac{1}{2}\left(cos(x-y) - cos(x+y)\right)
\end{aligned}$$

Some integrals which may or may not be needed include:

$$\begin{aligned}
\int sec(u)\ du &= ln\left|sec(u) + tan(u)\right| + c \\
\int csc(u)\ du &= ln\left|csc(u) - cot(u)\right| + c
\end{aligned}$$

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