Mathematics 181 – D

Fall 2006

Exam 3

October 24, 2006

_____
Name

Technology used: _____ Directions:

- Be sure to include in-line citations every time you use technology.
- Include a careful sketch of any graph obtained by technology in solving a problem.
- **Only write on one side of each page.**
- **When given a choice, specify which problem(s) you wish graded.**

You must do this problem

equired Problem (10 points) Express the integrand of the following integral as a sum of partial fractions with undetermined coefficients. **Do not solve for the coefficients or evaluate the integrals.**

$$\int \frac{x^{12} - 6x^5 + 7}{x^3 (x+3)^2 (x^2+9) (x^2+x+5)^3} \, dx$$

Do any six (6) of the following problems

1. (15 points) Write an integral for the area of the surface generated by revolving the curve $y = \cos(x)$, $-\pi/2 \leq x \leq \pi/2$ about the x - axis. **Do not evaluate the integral.**
2. (15 points) The half-life of californium-252 is 2.645 years. How long will it take 95% of a sample's radioactive nuclei to disintegrate?
3. (15 points) Find the center of mass of a thin plate covering the region between the x-axis and the curve $y = 2/x^2$, $1 \leq x \leq 2$, if the plate's density at the point (x, y) is $\delta(x) = x^2$. If you prefer to have units, x is measured in centimeters, and mass is measured in grams.
4. (15 points) Use integration by parts to evaluate the integral
$$\int \arctan(x) \; dx$$
5. (15 points) Evaluate the integral
$$\int \sin^2(2\theta) \cos^3(2\theta) \; d\theta$$
6. (15 points) Find the length of the curve $y = \ln(\sec(x))$, $0 \leq x \leq \pi/4$.
7. (15 points) Use a trigonometric substitution to evaluate the integral
$$\int \frac{x^2}{x^2+4} \, dx$$
8. (15 points) Express the integrand of the following integral as a sum of partial fractions and evaluate the integrals
$$\int \frac{x^2 + 2x + 1}{(x^2+1)^2} \, dx$$