Exam 2 Name:__________________________

Math 224.01
October 20, 2008

The point values for each problem are given below.
YOU MUST SHOW YOUR WORK/JUSTIFY YOUR ANSWER TO RECEIVE FULL CREDIT FOR A PROBLEM.

Question	**Points Earned**	**Points Possible**
1		10
2		5
3		5
4		7
5		15
6		10
7		5
8		10
9		10
10		10
Total		85

Math 224, Section 01 Name:______________________________

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1. Estimate the integral $\int_0^2 x^4 + 6 \; dx$ using the following methods.

   (a) Trapezoid Rule with $n = 4$ steps.

   (b) Simpson's Rule with $n = 4$ steps.

2. Estimate the minimum number of subintervals needed to approximate the integral

$$\int_3^4 (2x^3 + 5x) \; dx$$

with an error of magnitude less than 10^{-4} using the Trapezoidal Rule.
Note: Recall that

$$|E_T| \leq \frac{M(b-a)^3}{12n^2}.$$

3. Evaluate the integral $\int \frac{\sqrt{6x - x^2}}{x} \, dx$ using a table of integrals.

4. Evaluate the integral $\int \frac{dx}{x \ln x \sqrt{\ln x + 3}} \, dx$ by making a substitution and then using a table of integrals.

5. Evaluate the following integrals or state that they diverge.

(a) $\int_1^\infty e^{-3x}\, dx$

(b) $\int_1^\infty \frac{\ln x}{x}\, dx$

(c) $\int_0^1 \frac{x^4+1}{x}\, dx$

6. Recall that

- $\displaystyle\int_1^\infty \frac{1}{x^p}\,dx$ converges for $p > 1$ and diverges for $p \leq 1$.
- $\displaystyle\int_0^1 \frac{1}{x^p}\,dx$ converges for $p < 1$ and diverges for $p \geq 1$.
- $\displaystyle\int_0^\infty e^{-ax}\,dx$ converges for $a > 0$.

Determine whether the following integrals converge or diverge using integration, the Direct Comparison Test, or the Limit Comparison Test. You do **not** need to evaluate the integrals.

(a) $\displaystyle\int_1^\infty \frac{1}{e^{3t} + t + 1}\,dt.$

(b) $\displaystyle\int_1^\infty e^{-x}\sin x\,dx.$

7. Set up but **do not evaluate** the integral that determines the arc length of the function $f(x) = \sqrt{16 - x^2}$ from $x = 0$ to $x = 4$.

8. Consider the region bounded by $y = e^x$, the x-axis, and the lines $x = 0$ and $x = 3$. Find the volume of the solid obtained by rotating the region about the x-axis.

9. The region enclosed by the curves $y = x^2$ and $y = 2x$ is rotated about the y-axis. Find the volume of the solid generated by this rotation.

10. Use the shell method to write a definite integral representing the volume of the solid obtained by revolving the region bounded by $x = 3y - y^2$ and the y-axis about the line $y = 4$. (You do **not** need to evaluate the integral.)