MATH 1272
Midterm I
Professor Bramson
October 2, 2008

Name:_____

T.A.:_____

INSTRUCTIONS: There are 100 points possible on the exam. Do as many problems as you can. Answers must be in the boxes provided to be counted. Show your work in the space provided below each problem - outside the boxes. If you need extra space, state where the work is being done. Also, be sure to justify your answers. Note that some formulas are given on page 8. Page 7 is provided as scratch; be sure your exam has all 8 pages. **NO CALCULATORS** are permitted. GOOD LUCK!

1. (10 pts) Compute $\int e^{y+e^y}\, dy$.

2. (10 pts) Compute $\int \log^2 u\, du$.

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3. (10 pts) What can you say about $\int_1^6 \frac{1}{x^2-4x+4}\,dx$? For instance, is it finite? infinite? undefined? Can you compute it? Be explicit.

4. (10 pts) Suppose a motorist has travelled from the point $(0,1)$ to $(2,5)$ along a road whose x and y coordinates are given by $y = x^3 - 2x + 1$. How far has the motorist gone? You should leave your answer as an integral. Show any formulas you are using.

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5. (15 pts) Apply the trapezoidal rule to approximate $\int_1^2 \sin(x^2)\,dx$ using $n = 4$. Write your answer as a sum of sine functions.

As $n \to \infty$, how quickly does the error in the trapezoidal rule go to 0, in terms of a power of n? (You don't need to give the other coefficients.)

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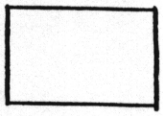
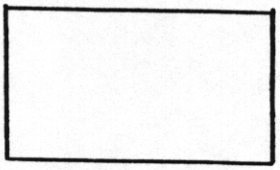
6. (5 pts) Which substitution(s) might one try for $\int \tan^3 x \sec^4 x \, dx$? Only put down one answer, making the best choice. (No justification is required.)

(A) $u = \tan x$ (C) either $u = \tan x$ or $u = \sec x$ (E) $u = \sec x \tan x$

(B) $u = \sec x$ (D) $u = \tan x + \sec x$ (F) $u = \sin x$



7. (10 pts) One can use the method of partial fractions to rewrite $\frac{1}{x^3+5x^2+6x}$ as $\frac{A}{x} + \frac{B}{x+2} + \frac{C}{x+3}$. What is A? Show your work.



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8. (15 pts) What is the volume of the solid obtained by rotating the curve $y = \sin x$ from $x = 0$ to $x = \pi/2$ around the x axis? Show your work, including any formulas you use. Make a sketch.

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9. (15 pts) Which of the following is true for

$$\int_2^\infty \frac{x^2 \sin^6 x}{1+x^4}\, dx?$$

(A) The limit exists and it is finite.

(B) The limit exists and it is ∞.

(C) The limit exists and it is $-\infty$.

(D) The limit does not exist.

Explain your answer *carefully*, stating all results that you are using.