Math 125, Section I, Winter 2011, Midterm II

February 24, 2011

Name_____

TA/Section_____

Instructions.

- There are 4 questions. The exam is out of 40 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. **Hand in your notes with your exam paper.**
- You may use any of the 20 integrals in the table on p. 484 of the text without deriving them. Show your work in evaluating any other integrals, even if they are on your note sheet.
- You may use a calculator which does not graph and which is not programmable. Even if you have a calculator, give me exact answers. ($\frac{2\ln 3}{\pi}$ is exact, 0.7 is an approximation for the same number.)
- **Show your work**. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. If you continue at the back of a page, make a note for me. Please BOX your final answer.

Question	points
1	
2	
3	
4	
Total	

1. Evaluate the following integrals.

   (a) (5 points)

$$\int \sqrt{x} e^{\sqrt{x}} dt$$

   (b) (5 points)

$$\int \frac{x}{x^2 + 4x + 9} dx$$

2. Evaluate the following integrals

(a) (5 points)

$$\int_3^{3+\sqrt{3}} \frac{x}{\sqrt{x^2-6x+10}}\ dx$$

(b) (5 points)

$$\int_2^4 \frac{x+1}{2x^3+x^2-3x} dx$$

3. The improper integral

$$\int_0^\infty e^{-x^3}\,dx$$

converges.

(a) (4 points) Estimate the integral $\int_0^2 e^{-x^3}\,dx$ using Simpson's rule with $n = 6$. Give your answer with 3 digits after the decimal point.

(b) (5 points) Show that the integral $\int_2^\infty e^{-x^3}\,dx$ converges by comparing it to an improper integral you can evaluate.

(c) (1 point) Estimate $\int_0^\infty e^{-x^3}\,dx$ using your results above. Give your answer with 3 digits after the decimal point.

4. (10 points) The region bounded by the y-axis on the left and $y = \tan(x^2)$ on the right from $y = 0$ to $y = 1$ is rotated about the y axis to form a tank. The units on the axis are in meters. Find the work done to fill this container with seawater of density 1025 kg/m^3 pumped from the ground level at $y = 0$. Take the acceleration due to gravity to be 9.8 m/s^2. Below is the graph of $y = \tan(x^2)$ to get you started.