Math 125A - Spring 2003
Mid-Term Exam Number Two
April 24, 2003

Name: _____ Section: _____

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
Total	70	

- This exam consists of 7 problems. Be sure that you complete all 7 problems.
- You may use a scientific (non-graphing) calculator during this examination. Other electronic devices are not allowed.
- You may use one hand-written 8.5 by 11 inch page of notes. You can use both sides of the note page.
- **Show all work for full credit**.
- Unless the problem specifies an approximation, an exact answer should be given.
- Mechanisms are in place to render cheating detectable and ineffective.
- You have 80 minutes to complete the exam.

1. Consider the region in the first quadrant bounded by $y = x^{\frac{3}{2}}$, $x = 0$ and $y = 8$. Suppose this region is revolved about the y-axis to create a three-dimensional solid. Suppose we have a tank with the shape of that solid, oriented so that the y-axis is perpendicular to the ground, the origin is at the bottom of the tank, and units are in meters (so the tank is 8 meters tall). If the tank is filled with a liquid with density 2300 kg/m^3, how much work is required to pump all of the liquid to the top of the tank?

2. For what $k > 0$ do $y = x^2$ and $y = 10 - x^2$ have the same average value on the interval $[0, k]$?

3. Use Simpson's Rule with $n = 6$ to approximate the integral:

$$\int_2^5 \frac{1}{\ln x}\, dx$$

Maintain at least 4 digits of precision at all times.

4. Evaluate each of the following integrals:

(a) $\int x^5 \ln x \, dx$

(b) $\int \sin^3 x \cos^6 x \, dx$

5. Evaluate each of the following integrals:

(a) $\displaystyle\int \frac{3\,dx}{x^2+3x-10}$

(b) $\displaystyle\int \frac{5\,dx}{x^2+8x+20}$

6. Evaluate the following integrals.

(a) $\int \frac{dx}{\sqrt{x^2 - 8x + 18}}$

(b) $\int \frac{dx}{x^3 + 3x^2}$

7. Evaluate the following integrals.

(a) $\int x^3 e^{x^2}\, dx$

(b) $\int \dfrac{dx}{(x^2-1)^{\frac{5}{2}}}$