Math 125 C - Winter 2005
Mid-Term Exam Number Two
February 24, 2005

Name: _____   Section: _____

1	20	
2	20	
3	20	
4	20	
5	10	
6	10	
Total	100	

- Complete all questions.

- You may use a calculator, and you should have one, during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.

- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.

- Show all work for full credit.

- You have 80 minutes to complete the exam.

.

1. Evaluate the integrals.

   (a) $\displaystyle \int \sin^3 x \cos^{23} x \, dx$

   (b) $\displaystyle \int \sin^2 x \cos x \ln \sin x \, dx$

2. Evaluate the integrals.

(a) $\displaystyle\int \frac{x^5}{\sqrt{x^2-4}}\, dx$

(b) $\displaystyle\int \frac{x^3}{x^2-x-6}\, dx$

3. Evaluate the following integrals.

(a) $\displaystyle\int x^7 e^{x^4}\, dx$

(b) $\displaystyle\int \frac{dx}{x^2 + 6x + 20}$

4. Evaluate each of the following integrals. Either give the value of the integral or show that it is divergent.

(a) $\displaystyle\int_0^{\ln 2} \frac{1}{e^x - 1}\, dx$

(b) $\displaystyle\int_2^\infty \frac{dx}{x^2\sqrt{x^2 + 1}}$

5. A tank is shaped like the solid of revolution created by revolving the region in the first-quadrant bounded by $y = x^5$, $y = 32$, and the y-axis about the y-axis. Assume units are meters.

   If the tank is filled with a liquid with density of 900 kg/m³, how much work is done in pumping all of the liquid in the tank to a point 3 meters above the top of the tank? Acceleration due to gravity of 9.8 m/s².

6. For what value of $k > 0$ does the function

   $$f(x) = kx^2 + \frac{1}{k}x$$

   have the minimum possible average value on the interval $[0, 1]$?