Math 126 **First Midterm, Fall 2007**

Instructions: Do all your work in the provided blue book. Make sure you write your name and recitation number on the blue book.

Write all your answers exactly. Do not use approximations for numbers like π or $\sqrt{2}$. NO CALCULATORS!

Good luck!

1. A liquid leaked from a tank at a rate $r(t)$, where r is in liters per hour, and t is in hours. The rate decreased as time passed. This rate was measured every 2 hours, and the result is given below. Find an upper estimate for the total amount of oil that has leaked out after 6 hours.

t	0	2	4	6
r(t)	9	7.5	7	6

2.

$$\int_2^3 f(x)dx = 1/3, \qquad \int_3^5 f(x)dx = 6, \qquad \int_2^5 g(x)dx = 4/5.$$

Find

$$\int_2^5 (g(x) + 4f(x) + 5)dx.$$

3. Express the integral as the limit of Riemann sums. Do not evaluate the limit. Do not use Δx or x_i^* in your final answer; instead, plug in the formulas for these.

$$\int_2^{12} \frac{\sqrt[3]{x}dx}{2+3x}$$

4. Let

$$f(w) = \frac{w^4 - 2w^2\sqrt{w}}{w}.$$

(a) Find $f'(w)$.

(b) Find $\int f(w)dw$.

5. Simplify.

(a)

$$\frac{d}{dx}\left(\int_{\pi}^{e^x} 3\cos t dt\right).$$

(b)

$$\int (2x^{-1} + 7\sin x)dx$$

6. The velocity of a particle at time t is given by $v(t) = 3t^2 - 1$. The position of the particle at time $t = 0$ is 1. Find the position of the partice at time $t = 3$.

7. Consider the following integral

$$\int_1^2 3 + 2x \; dx$$

(a) Express the integral as the limit of Riemann sums. Do not evaluate the limit. Do not use Δx or x_i^* in your final answer; instead, plug in the formulas for these.

(b) Use the formula $\sum_{i=1}^{n} i = \frac{n^2+n}{2}$ to evaluate the limit in the previous part. DO NOT CALCULATE THE INTEGRAL DIRECTLY, or you will get no credit.