Test 4 Review
Fall 2006
MATH 121 Section 02

Directions : Below is a list of several problems similar to those that will be on the exam.

1. Find the point on the line $y = 2x + 1$ that is closest to the origin.

2. Find the dimensions of a rectangle of largest area that can be inscribed in a circle of radius r.

3. A cylindrical can without a top (who needs it?) is made to contain V cm^3 (where V is some constant) of liquid. Find the dimensions that will minimize the cost of the metal to make the can.

4. Kindly be able to draw pictures and explain what the following means if f is a continuous function on the interval $[a, b]$:

$$\int_a^b f(t)dt = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i^*)\Delta x.$$

5. Compute the Riemann sum for the function $f(x) = x^2 + x + 2$ over the interval $[1, 4]$ where $n = 6$ and $x_i^* = x_i$. I.e., compute

$$\sum_{i=1}^{6} f(x_i)\Delta x.$$

6. Let $v(t) = t^2 - 6t + 5$ be the velocity function for a particle moving on a straight line. Compute

   (a) the total distance travelled from $t = 0$ to $t = 5$.

   (b) the net distance travelled from $t = 0$ to $t = 5$.

7. Compute the following:

(a)

$$\int 3x \sin(x^2) dx$$

(b)

$$\int \cos(x)\sqrt{1+\sin(x)} dx$$

(c)

$$\int e^{\cos(\sin(\theta))} \ln(\theta^2+3) dx$$

(d)

$$\int \sec(x)\tan(x) dx$$

(e)

$$\int (x+1)^{348} dx$$

(f)

$$\frac{d}{dx}\int_1^x t^2 - \sin(t)\cos(t) dt$$

(g)

$$\frac{d}{dx}\int_x^{-2} \xi \sec(\xi) + \csc(\xi)\xi d\xi$$

(h)

$$\frac{d}{du}\int_{10}^{u^2+1} 2x + \cos(x) dx$$

(i)

$$\frac{d}{dx}\int_{-2x}^{x^2} 3t + 1 dt$$