Math 142 Exam 2 Spring 1999 Name
No Work-No Credit SS#

1) Determine the area of the region bounded by $x + y^2 = 2$, $x + y = 2$.
(sketch the region, set up the integral then solve.)

$$\int_0^1 \{(2 - y^2) - (2 - y)\}\, dy = \frac{1}{6}$$

2) Revolve the region bounded by $y = x^2$, $y = - x^2$, $x = 1$, $x = 2$ about the line $x = -3$ and determine the volume of the solid generated. (First set up the integral, then you may solve using the calculator)

$$\int_1^2 2p\,(x+3)(2x^2)\, dx \approx 135.09$$

3) Revolve the region determined by y = $\sin^4$ x , x = 0, x = π, y = 0 , about the x-axis and determine the volume of the solid generated. (Set up the integral, then solve using the TI-86)

$A_i = p(\sin^4 x)^2$, then $V_i = p \sin^8 x \, dx$ so $\int_0^p p \sin^8 x \, dx \approx 2.699$

4) Determine the circumference of the ellipse given in parametric form:

x = 2 cos t   y = sin t $0 \le t \le 2p$

$$L = \int_0^{2p} \sqrt{4\sin^2 t + \cos^2 t} \, dt \approx 9.69$$

5) Find the average value of $f(x) = e^{-x^2}$, over the interval [0,3].

$$\int_0^3 \frac{1}{3} e^{-x^2}\, dx \approx 0.295$$

5) A trough is filled with a liquid and its vertical ends have the shape of a parabola given by $y = x^2$, $-3 \le x \le 3$. Determine the hydrostatic force on one end of the trough.

$A_i = 2x_i\,\Delta y = 2\sqrt{y_i}\,\Delta y$, Assuming $\Delta y << 1$ then $P_i = rg(9 - y_i)$ and

$F_i = P_i A_i = rg(9 - y_i)(2\sqrt{y_i}\,\Delta y)$ so then

$$F = r\int_0^9 2(9.8)\sqrt{y}(9 - y)\, dy \approx 1270\, r$$