Workshop 7

1. Suppose R is the region in the plane enclosed by $y = x^2$ and $y = 4$.

a) Compute the perimeter P and area A of R, and then compute the ratio $Q = A/P^2$.
Note: By squaring the perimeter the ratio becomes independent of the units chosen to measure the region.

b) Compute this ratio $Q = A/P^2$ for these four regions: the region R, a square, a circle, and an equilateral triangle. Draw the figures in increasing order of Q.

2. The curve $y = e^x$, $x \geq 0$, is revolved about the x-axis. Does the resulting surface have finite or infinite area? Is the volume enclosed by this surface finite or infinite? (Remember that you can sometimes decide whether an improper integral converges without calculating it exactly.)

3. The point P travels on the parabola $y = x^2$.

a) Give parametric formulas for the location of P where the parameter is the first coordinate of the point P.

b) Give parametric formulas for the location of P where the parameter is the second coordinate of the point P. The parametric formulas will have to be given "piecewise".

c) Give parametric formulas for the location of P where the parameter is the angle that the ray from the origin to P makes with the positive x-axis.

d) Give parametric formulas for the location of P where the parameter is the angle that the ray from the point $(0, 1)$ to P makes with the ray from $(0, 1)$ to the origin.

e) Give parametric formulas for the location of P where the parameter is the distance from the origin to P. The parametric formulas again will have to be given "piecewise".