MATH 141, FALL 2008, MIDTERM 1 - REVIEW

1) Find the value of the following limit, if it exists:

$$\lim_{x\to\infty}\left(1+\frac{1}{x^2}\right)^x.$$

If the limit does not exist, explain why.

2) Let $f(x) = 1/(1-x^2)^{1/4}$, and let R be the region between the graph of f and the x axis on $[0, 1/2]$. Find the volume V of the solid obtained by revolving R about the x axis.

3) Find the length of a curve given parametrically by

$$x = f(t) = e^t \sin(t)$$

and

$$y = g(t) = e^t \cos(t),$$

for $0 \le t \le \pi/2$.

4) Evaluate the integral:

$$\int e^x(1-e^{2x})^{-0.5}\,dx$$

5) A swimming pool has the shape of a right circular culinder with radius 10 feet and depth 8 feet. If the pool contains 5 feet of water, what is the work required to pump all the water to the top of the pool?