MATH 141, FALL 2008, MIDTERM 1

Instructions: Answer each question on a separate answer sheet, labeled with the problem number. Do not put the answers to two different problems on the same answer sheet. If you need extra room, continue on the back. Show all your work. A correct answer with no justication may not receive full credit. Mark your final answer clearly. Do NOT bother about the pledge. Each problem is worth 20 points.

No notes, books, or electronic devices allowed.

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

2) Find the length of a curve given parametrically by

$$x = f(t) = 2^t \sin(t)$$

and

$$y = g(t) = 2^t \cos(t),$$

for $0 \le t \le 2$.

3) A swimming pool has the shape of a cone with radius 10 feet at the top and depth 10 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?

4) Evaluate the integral:

$$\int \frac{x}{\sqrt{1 - x^4}} \, dx$$

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

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

If the limit does not exist, explain why.