Name:_____
SID:_____
Section:_____

Midterm Exam #1-Math 022-F '07
Instructor: Devin Greene

The exam is 50 minutes long. No calculators or notes are permitted. Show your work. You do not need to simplify your answers.

Problem #1 (10 points)

A 10 meter high monument has circular horizontal cross sections with area $A(x) = 10\sin\left[\frac{\pi}{200}(10-x)^2\right]$, where x is the height in meters from the ground. Write out, *but do not evaluate,* an integral representing the volume of the monument.

For Problems #2 and #3, find the volume of the solid of revolution.

Problem #2 (10 points)

The region bounded by the curves $x = 1, y = 0,$ and $y = x^4$ is rotated around the y-axis.

Problem #3 (10 points)

The region bounded by the curves $y = 1, y = (x-1)^4$ is rotated around the x-axis.

Problem #4 (10 points)

The pharaoh wishes to build a pyramid for his cat. The pyramid will have a 10 meter by 10 meter square base and will stand 10 meters high at its apex. The stone used to construct the pyramid is gathered from the ground nearby and weighs 20,000 newtons per cubic meter. How much work is required to build the pyramid? State your answer in joules (=newton-meters). You may assume that the cat's burial chamber has negligible volume.

Problem #5 (10 points)

Find the average value of the function $f(x) = |x+1|^3$ on the interval [-2,2].
For which value of x in the interval does $f(x)$ take the average value?