Math S212 Exam 2 Name:

1. (12 pts) What estimate does Simpson's rule give for $\int_0^1 x^2\,dx$ if you evaluate only at 0, 1/2, and 1?

2. (12 pts) Evaluate the integral $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$ or indicate if it diverges and why.

3. (20 pts) Find the area of the region bounded by the line $y+2x=0$ and the parabola $y=x^2$. Find the volume of the solid obtained by rotating this region about the x-axis.

4. (12 pts) Find the volume of the solid of revolution obtained by rotating the figure bounded by the coordinate axes and the curve $y=\cos^{-1}x$ around the x-axis.

5. (12 pts) Show that the mean value theorem for integrals is true for the function $f(x) = x^2$ on the interval $[1, 4]$ by finding the value of the number c giving the mean value.

6. (12 pts) If a spring has natural length 10 cm. and it takes 20 J of work to stretch it from 10 cm. to 20 cm., how much work does it take to compress it from 10 cm. to 5 cm.?

7. (20 pts) Find the arc length of the curve $y = \cosh x = \frac{e^x + e^{-x}}{2}$ from $x = 1$ to $x = 2$. Find the area of the surface of revolution obtained by rotating this arc around the x-axis.

BONUS (10 pts) Evaluate the integral $\int_0^\infty \frac{dx}{x^2(x-1)^2}$ or indicate if it diverges and why.