Calculus II, Exam III, Spring 2009

Name:_____

Student signature:_____

Show all your work and give reasons for your answers. Good luck!

Part I

Each problem in part I is worth 10 points; Show your work!!

Evaluate the following integrals

(1) Find the area bounded by the graphs of the functions $y = x^7 + x^2 + 1$ and $y = -x^3$ between $x = 0$ and $x = 1$.

(2) Evaluate $\int_0^\infty \frac{1}{x^2+1}\, dx$

(3) Find the arc length of the curve $\vec{r}(t) =< (4/3)t^{3/2}, 3t, 2t >$ for $0 \le t \le 1$.

(4) If it takes $F = 2\,N$ to stretch a spring $1/10\,m$ from its rest position, find the work done in stretching this spring $3/10\,m$ from its rest position.

Part II

Each problem in part II is worth 15 points. Justify all your work for full credit!!

In the next two problems **set up** integrals for the volume of the solid obtained by rotating the area bounded by $y = x^5 + x^3 + 2$, $y = \sin(x)$, $x = 1$ and $x = 2$ about the indicated axis.

5. Rotate about the line $x = -2$.

6. Rotate about the line $y = -3$.

7. Find the Volume of the solid whose cross sections perpendicular to the x-axis are squares one side of which stretches from the graph of $y = \sqrt{x}$ to $y = x^2$ for $0 \le x \le 1$.

8. Find the work done in pumping all the water out of a full swimming pool with dimensions $10 \ m \times 20 \ m$ and height $5 \ m$. Use $g \approx 10 \ m/sec^2$ and density of water $\rho = 1,000 \ kg/m^3$.