

Calculus II, Exam III, Spring 2013

Name: _____

Student signature: _____

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

Part I

Each problem in part I is worth 7 points; Show your work!!

Evaluate the following integrals

- (1) Find the area bounded by the graphs of the functions $y = x^4 + x + 1$ and $y = -x^2$ between $x = 0$ and $x = 1$.

- (2) Evaluate $\int_0^\infty \frac{1}{x^2+1} dx$. Determine if the integral is convergent or divergent.

- (3) Find the arc length of the curve $\vec{r}(t) = \langle (4/3)t^{3/2}, 3t, 2t \rangle$ for $0 \leq t \leq 1$.
- (4) Set up an integral for the volume of revolution of the solid obtained by rotating the region bounded by $f(x) = x^2 + x$, $g(x) = \sin(x) + 5$ and $0 \leq x \leq 1$ about the x-axis.
- (5) Set up an integral for the volume of revolution of the solid obtained by rotating the region bounded by $f(x) = x^2 + x$, $g(x) = \sin(x) + 5$ and $0 \leq x \leq 1$ about the y-axis.

- (6) Find the work done in moving a mass of 3 kg a horizontal distance of 2 m and vertical distance of 5 m.
- (7) Set up an integral for the arc-length of the graph of the function $y = f(x) = (x^3 + x)^5$ for $2 \leq x \leq 3$.

Part II

Each problem in part II is worth 13 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 $y = x^9 + x^3 + 2$, $y = \cos(x)$, $x = 1$ and $x = 2$ about the indicated axis.

- (1) Rotate the above region about the line $x = 4$.

(2) Rotate the above region about the line $y = -3$.

- (3) 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 $y = 2x + 1$ to $y = -x$ for $0 \leq x \leq 1$.

- (4) Find the work done in pumping all the water out of a half full round (spherical) tank of radius 5 m . Use $g \approx 10\text{ m/sec}^2$ and density of water $\rho = 1,000\text{ kg/m}^3$.