Calculus II, Exam II, Spring 2007

Name:____________________

Student signature:____________________

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

Part I. All problems in part I are worth 9 points each.

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

(2) Find the volume of the solid of revolution obtained by rotating the area under the graph of $y = \sqrt{x}$, above the x-axis and between the line $x = 1$ and $x = 2$ about the x-axis.

(3) **Set up** an integral for the volume of revolution obtained by rotating the area bounded by the graphs of $y = f(x) = \sin(x)$, $y = x + 3$, $x = 0$ and $x = 2\pi$ **about the line** $\mathbf{y = -5}$.

(4) Use a Riemann sum with $n = 3$ terms, with the midpoint rule, to approximate the value of $\int_1^2 \cos(x^2)\, dx$. [You do not need to simplify or compute the sum.]

(5) How many terms would you have to use (at least) to ensure that the error in Problem **??** is less than 10^{-6} (you do not need to simplify the number).

(6) Find the work done in pumping water out of a swimming pool with dimensions $30\ m \times 100\ m$ and a depth of $10\ m$. [You can use the fact that water has a density of $1000\ kg/m^3$ and $g \approx 10\ m/sec^2$.] Like always, you must justify your answer!

(7) Evaluate the following integral, or state it is divergent (you must justify your answer): $\int_0^\infty \frac{1}{x^2+1}\,dx$.

Part II. All problems in Part II are worth 13 points.

(8) Find the volume of the solid whose cross sections with planes perpendicular to the x-axis are squares one side of which stretch from the graph of $y = x^3$ to the graph of $y = -x^2$ for $0 \leq x \leq 1$.

(9) Find the arc length of the graph of $y = x^{3/2}$ between the points $(1, 1)$ and $(2, \sqrt{2^3})$.

(10) Find the work done in pumping water out of a full container which is the lower half of a sphere of radius 12 m.