Final Exam, Calculus II, Spring 2007

Name:________________________

Signature:________________________

You must show your work and give reasons for your answers!
Good luck.

Part I. All problems in Part I are worth 7 points. Evaluate the following integrals:

(1) $\int_0^1 x^2(x^3+2x+1)\,dx$

(2) $\int x^2(x^3+1)^{15}\,dx$

(3) $\int x^2\sin(x)\,dx$

(4) $\int_0^\infty e^{-2x}\,dx$

(5) $\int \frac{x}{(x-1)(x+2)}\,dx$

(6) **Set up** an integral for the volume of the solid obtained by rotating the region bounded by $y = 2x + 1$, $y = -x^2$, $x = 0$ and $x = 1$ about the line $\mathbf{y = 5}$

(7) Find the interval and radius of convergence for the series $\sum_{n=1}^{\infty} \frac{(x-1)^n}{2^n\ n^3}$

(8) Express $f(x) = \frac{x}{5+2x}$ as a series. **Include the interval of convergence.**

(9) Find the equation of the plane through the points $(1, 2, 3)$, $(4, 3, 5)$ and $7, 9, 2)$.

(10) **Set up** a Riemann sum for $\int_0^1 e^{-x^2}\,dx$ using $n = 3$ terms and the midpoint rule. [You don't need to compute or add the numbers in the sum.]

Part II All problems in Part II are worth 10 points

(11) Use series to estimate the value of $\int_0^{(1/10)} \sin(x^2)\,dx$ with an error less than 10^{-7}. [You don't need to compute or add the numbers in the sum.]

(12) Find the work done in pumping water out of a ice cream cone of height $2m$ and radius $1m$. [You may use that the density of water is $1,000\,kg/m$ and $g \approx 10\,m/sec^2$]

(13) Find the line of intersection of the planes $2x + y - z = 3$ and $3x - y + 2z = 5$.