Calculus II, Fall 2006

Name:_____

Signature:_____

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

Part I. All problems in Part I are worth 6 points.
Evaluate the following integrals:

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

(2) $\int x\cos(x)\,dx$

(3) $\int \frac{1}{x^2-1}\,dx$

(4) **Set up** an integral for the volume of revolution obtained by rotating the area bounded by the graphs of $y = \sin(x)$, $y = 1$, $x = 0$ and $x = \pi/2$ around the line $\mathbf{y = 3}$.

(5) Find the interval and radius of convergence for the series $\sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n}}$

(6) Find the sum of the series $1 - x^2 + x^4 - x^6 + x^8 \ldots$. For which x is this valid?

(7) Find the angle between the vectors $< 1, 0, 0 >$ and $< 1, 1, 1, >$.

(8) Are the vectors $< 1, 1, 1 >$, $< 1, 0, 0 >$ and $< 0, 1, 0 >$ coplanar?

(9) Find the equation of the plane through the point $(-1, 0, 1)$ and perpendicular to the line $\begin{cases} x = 1 - 2t \\ y = 1 + t \\ z = 1 - 3t \end{cases}$

(10) Use a Riemann sum with $n = 4$ terms, and the midpoint rule, to estimate the value of $\int_0^{1/10} \frac{1}{1+x^5}\, dx$. [You don't need to add all the numbers in the sum.]

Part II All problems in Part II are worth 10 points

(11) Use series to estimate the value of $\int_0^{1/10} \frac{1}{1+x^5}\,dx$ with an error less than 10^{-7}.

(12) The intersection of solid S with planes perpendicular to the x-axis are round disks, whose diameters are contained in the xy-plane and stretch from the graph of $y = x$ to $y = x^2$ for $0 \leq x \leq 1$. Find the volume of S.

(13) Suppose an upside down pyramid has a square base of length 2m and a height of 3m, and is full of water. Find the work done in pumping all of the water over the upper edge. [You can use that water has a density of 1000 kg/m^3 and that the gravitational acceleration $g \approx 10\ m/sec^2$.]

(14) Find the distance between the lines $\begin{cases} x = 1 \\ y = 1 + t \\ z = 2 \end{cases}$ and $\begin{cases} x = s \\ y = 2 \\ z = 3 \end{cases}$