pages	$1-3$	$4-6$	$7-8$	$9-10$	$11-13$	*total*
scores						

Exam #2, November 19, Calculus III, Fall, 2007, W. Stephen Wilson

I agree to complete this exam without unauthorized assistance from any person, materials or device.

Name: ______________________________ Date: ______________

TA Name and section: ______________________

NO CALCULATORS, NO PAPERS, SHOW WORK. (28 points total)

1. (2 points) Set up the triple integral for the volume of a cube (1 point), $0 \leq x, y, z \leq 1$ and evaluate it (1 point).

2. (2 points total) What region is the double integral, $\int_0^1 \int_0^{-x+1} f(x,y)\,dy\,dx$, taken over? Sketch and label (1 point). Change the order of integration (1 point).

3. (1 points total) Consider the map $T(u, v) = (u, (1 - \frac{u}{b})v)$. Let D be the rectangular region $0 \leq u \leq b$, $0 \leq v \leq a$. What is the region $T(D)$? (Sketch and label.)

4. (2 points total) Set up a double integral on the region $T(D)$ from the previous problem to compute the area (1 point). Evaluate this integral to compute the area (1 point).

5. (3 points total) Use a change of variables to set up an integral on the region D to give the area of $T(D)$ from the previous problems. (1 point for the limits and 1 point for what is being integrated). Compute this integral over D to get the area of $T(D)$ (1 point).

6. (1 points) Let $f(x, y, z) = e^{x+y^2+z^3}$. Take the curve given by the path $c(t) = (t^2, t^4, t^6)$ from $t = 0$ to $t = 1$. Consider the vector field ∇f and compute $\int_c \nabla f \cdot d\vec{s}$.

7. (3 points) Define a function on the semi-circle $x^2 + y^2 = a^2$, $y \geq 0$, that takes a point on it to its y-coordinate. What is the average value of this function on the semi-circle? (2 points for setting up the integral (1 point for the limits and 1 point for what is integrated) and 1 point for getting the right answer using it.)

8. (3 points) Consider the curve that goes from $(0,0)$ to $(1,1)$ along $y = x^2$. Consider the vector field $F(x,y) = (x^2y, xy^2)$ in the xy-plane. Compute the line integral of F on this curve. (1 point for getting the path right, 1 for setting up the integral and 1 for evaluating it correctly.)

9. (3 points) Find the volume trapped between the graph of $f(x, y) = 1 - x^2 - y^2$ and the xy-plane. (1 point for the limits on the integral, 1 point for what is being integrated, and 1 point for getting the right answer.)

10. (3 points) Find the surface area of the graph of $f(x, y) = 1 - x^2 - y^2$ where it is above the xy-plane. (1 point for the limits on the integral, 1 point for the thing you integrate and 1 point for getting the correct answer.)

11. (1 point) What is the average height of $f(x, y) = 1 - x^2 - y^2$ where it is above the xy-plane?

12. (2 points) Consider a function on the surface given by the graph of $f(x, y) = 1 - x^2 - y^2$ where it is above the xy-plane that assigns the z-coordinate to a point on the surface. Set up the integral for the average height of this function. Do not integrate.

13. (2 points) Find a parameterization of the graph of $f(x,y) = 1 - x^2 - y^2$ where it is above the xy-plane that starts $\Phi(r,\theta) = (r\cos(\theta), -, -)$. Be sure and give the limits on r and θ.