MAC 2313, Section 03
Test 2

Name: ________________________ SSN: ________________________

As stated in class, you are allowed to bring to the test one 8.5x11 inch page, written on both sides. Calculators are allowed. Notebooks and textbooks are NOT allowed. This test will be graded out of 70.

1. (10 marks) Find and classify the critical points of $z = xy + \dfrac{8}{x^2} + \dfrac{8}{y^2}$.

2. (5 marks) Use Riemann sums with 2 subdivisions in each direction to estimate the value of $\int_R \sin(x+y)dA$ if R is the region $-\pi \leq x \leq 0, 0 \leq y \leq \pi$.

3. (5 marks) Evaluate $\int_2^3 \int_{-3}^3 \int_{-\sqrt{9-y^2}}^{\sqrt{9-y^2}} dxdydz$.

4. (10 marks) Let W be the region between the spheres $x^2 + y^2 + z^2 = 1$ and $x^2 + y^2 + z^2 = 4$. Evaluate $\int_W (x^2 + y^2 + z^2)^{1/2} dV$.

5. (10 marks) A gourmet coffee company sells decaffeinated coffee at a price of $\$p_1$ per can, regular coffee at $\$p_2$ per can and espresso coffee at a price of $\$p_3$. The quantity sold depends on the prices, where $q_1 = 200 - p_1$, $q_2 = 300 - 2p_2$ and $q_3 = 400 - 3p_3$ are the quantities of decaffeinated, regular and espresso coffee sold respectively. If the company can produce 750 cans per day, what selling prices optimize the total revenue?

6. (10 marks) Consider the change of variables $x = s + 3t$, $y = s - 2t$. Evaluate $\int_R (2x + 3y) dA$ where R is the region bounded by the lines $2x + 3y = 1$, $2x + 3y = 4$, $x - y = -3$, $x - y = 2$.

Bonus (2 marks): Sketch the region R and the corresponding region in the st-plane that corresponds to region R.

7. (10 marks) Compute the regression line for the points (1,0), (-2,3) and (4,-1) using least squares.

8. (5 marks) A solid is bounded below by the triangle $z = 0, x \geq 0, y \geq 0, x + y \leq 1$ and above by the plane $z = x + y + 2$. If the density of the solid is given by $\delta(x, y, z) = 2z$, set up an integral to find the mass of the solid (do not evaluate).

9. (5 marks) Reverse the order of integration to evaluate $\int_0^2 \int_{y^2}^{\sqrt{8y}} 2y dx dy$.

Bonus (5 marks) The region W is the portion of a sphere of radius 1 shown below. Write integrals for $\int_W f(x, y, z)dV$ in (a) Cartesian coordinates, (b) cylindrical coordinates, (c) spherical coordinates. Do not evaluate the integrals.