Math 323
Exam 5 **Name:**____

Instructions: This exam is a "Take Home" exam. You will have until 4:00pm on Thursday, May 7th to complete this exam. You MAY NOT consult with classmates (or anyone else for that matter) on this exam. The credit given on each problem will be proportional to the amount of correct work shown. Answers without supporting work will receive little credit.

1. (10 points) Set up an integral in terms of a single variable t that respresents the mass of a wire whose shape is the portion of $y = 2 - x^2$ from (0,2) to (2,-2) and whose density is given by $\rho(x, y) = x^2 - 2xy$. DO NOT EVALUATE THE INTEGRAL.

2. (10 points) Show that the line integral $\int_C (ye^{xy})dx + (xe^{xy} - 8y)\, dy$ is independent of path, and evaluate it if C runs from (1,0) to (-2,-1).

3. (12 points) Use Green's Theorem to evaluate $\oint_C (x^3 \sin(x^2) - 4y)dx + (e^{\cos(y^2)} + 7x)\, dy$, where C is the circle $x^2 + y^2 = 9$ oriented counterclockwise.

4. (12 points) Use a line integral to calculate the area of the circle $x^2 + y^2 = 4$.
[You must use the correct method to receive credit on this question]

5. (12 points) Find the surface area of the portion of the plane $x + 3y + z = 6$ inside the cylinder $x^2 + y^2 = 1$.

6. (12 points) Use the Divergence Theorem to evaluate the flux integral $\displaystyle\iint_S F \cdot n \, dS$, where $F = \langle x - y^3, e^{xz}, xy + z \rangle$ and S is the boundary of the solid Q given by $z = 1 - x^2 - y^2$ and the xy-plane.

7. (8 points) Determine whether or not the vector field $F = \langle 2xz - 3y^2, -6xy, x^2 \rangle$ is conservative.