MAT 302
Homework # 3
Due: Thursday, February 9th, 2017

Directions: Write careful solutions to each of the following problems on separate sheets of paper. (You may put more than one solution on the same sheet of paper, if you have enough room). Be sure to show all of your work. You are allowed to talk to your classmates about these problems. If you do receive help from a classmate, be sure to give them credit by noting their name on your solution. All solutions should be written in your own words, regardless of if you've received help. Partial credit is available. Each problem is worth five points.

1. Let $u(x, y) = x^2 - 2xy + y - y^2$ and $v(x, y) = -x + 2xy + x^2 - y^2$. Verify that the functions u and v satisfy the *Cauchy-Riemann Equations:*

$$\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y} \qquad \text{and} \qquad \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}.$$

2. Let $w(x, y, z) = 2x^2y^2z$, where $x = 2t - 1$, $y = \cos t$, and $z = t^3$. Find $\frac{dw}{dt}$ by:

   (a) using the Chain Rule from section 13.5.

   (b) using substitution to write w as a function of t and computing the derivative directly.

3. Differentiate the following implicitly to find all of the first partial derivatives of w:

$$3x^2w^2 - 2yz^2 = 2520.$$