Math 3334 **EXAM 1** **NAME**_____
September 28, 2018

1. Assume the following are defined:
   a. Neighborhood
   b. Interior point
   c. Boundary point

Define the following concepts. Use complete sentences and be sure to identify the object being defined.

   a. Open (5 pts each)
   b. Closed
   c. Limit point
   d. Compact
   e. Continuous at a point x_0
   f. Continuous on a set D

2. Prove that a union of an infinite collection of open sets is open. 10 pts

3. Prove that if K is compact and $f : K \to \mathbf{R}^n$ is continuous, then f(K) is compact. 15 pts

3. Prove that there is a solution to $e^x = \frac{3}{x^2}$ between x = 1 and x = 2. You may assume that the exponential function is continuous and that e is approximately 2.72. 15 pts

4. Use the definition of limit to show that $\lim_{(x,y)\to(0,0)} \frac{2x^2 - 3y^2}{\sqrt{x^2 + y^2}} = 0$. 15 pts

5. Let Q_0 be the set of rational numbers in [0,1]. Prove that the closure of Q_0 is [0,1]. 15 pts