## Math 2534 Homework 4 Proof methods Spring 2018 Follow homework requirements to avoid point deductions.

**Problem 1:** Determine if the following is true or false and justify your conclusion.  $(\forall x, x \in D_1 \rightarrow [\exists y | y \in D_2 \land P(x, y)]) \rightarrow (\forall y, y \in D_2 \rightarrow [\exists x | x \in D_2 \land P(x, y)])$ 

**Problem 2:** Use direct proof or counter example. (use previous theorems only) **Theorem:** If a and b are odd integers and c is an even integer, then  $(a^2-1)b+c$  is an even integer.

**Problem 3:** Use direct proof or counter example. (use definitions only) **Theorem:** For integers a, b, and c, if a|c, and a|b then a|(b-2c).

**Problem 4:** Use direct proof or counter example. (Use definitions only) **Theorem:** The quotient of two non-zero rational numbers is rational.

**Problem 5:** Prove by direct proof or counter example. (use definitions only) Theorem: If a|bc, then a|b for integers a, b, c

**Problem 6:** Use proof by **Contrapositive** or counter example. (use previous theorems only) **Theorem:** If  $n^3$  is odd, then n is odd where n is a natural number.

**Problem 7:** Use proof by **Contrapositive** or counter example. (use definitions only) Theorem: For all non-zero integers **a**, **b**, and **c**, if **a** does not divide **bc** then **a** does not divide **b**.