# Math 300 Intro Math Reasoning
## Worksheet 02: Mathematical logic

(1) Prove the following statement: An integer is divisible by 5 if and only if its last digit is divisible by 5.

[Hint: To formally refer to the unit number of an integer $n$, decompose $n = 10k + d$ where $k$ is some integer and $0 \le d \le 9$. Then $d$ is the unit digit of $n$.]

(2) Let $a, b$ be integers with $b \ne 0$. Prove that any integer solution to the quadratic equation $x^2 + ax + b = 0$ divides $b$.

(3) Compute the negation and prove or disprove the following statement.

$$\forall x (\forall y ((x < y) \Rightarrow (\exists z (x < z \wedge z < y)))).$$