

DISCRETE MATHEMATICS 1 (MS4111): TUTORIAL 3

1. Let $p(x)$ be a predicate in the variable x . State clearly when the universally quantified statement

$$\forall x, p(x)$$

is true and when it is false.

2. Let $p(x)$ be a predicate in the variable x . State clearly when the existentially quantified statement

$$\exists x, p(x)$$

is true and when it is false.

3. Prove that the following existentially quantified statement

$$\exists x, \frac{x}{x^2 + 1} = \frac{2}{5}$$

is true.

4. Prove that

$$\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, \quad x^2 < y^2 \Rightarrow x < y$$

is false.

5. Prove that

$$\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, \quad x^2 < y^2 \Rightarrow x < y$$

is true.

6. Prove that the following statement

$$\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, \quad x + y = 0$$

is true.

7. Prove that the following statement

$$\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, \quad x + y = 0$$

is false.