School of Engineering
Department of Basic Sciences

Discrete Math I
July 16, 2019
Second Exam

Student name: _____   Student number: _____

1. (5 points) Determine whether each of the following statements is true or false

   (i) A theorem is a statement we assume to be true.

   (ii) $\{\phi, 1, \{\phi\}\} \subseteq \{0, 2, \{1\}, \{\phi\}, 9, 3, \phi\}$.

   (iii) There is an onto function from the set $A = \{a, b, c, d, e, f, g\}$ into the set $B = \{0, 2, 4, 6, 8, -2, -4, -6\}$.

   (iv) Suppose that $f : A \to B$ is surjective and that $S \subseteq A$. Then $|S| \geq |f(S)|$.

   (v) Let A be a nonempty set, then $A \subseteq P(A)$.

2. (1+2+2+2 points) Fill in the blanks with the answers only

   (i) To show that p implies q vacuously, one uses the fact that ....

   (ii) Given that $\lceil -x \rceil = 5$. The solution set for x is

   (iii) Let $f(x) = \lceil x^3 \rceil$. Then $f(-1, 1) =$ or $f(\mathbb{R}) =$

   (iv) Given that the universal set $U = \{a, b, c, d\}$. A set with exactly one element is represented by

3. (3 points) Let A and B be two sets. Show that $A \cap B \subseteq A \cup B$.

4. (2 points) Let $A_i = [\frac{1}{i}, i + 1]$. Find $\bigcup_{i=1}^{\infty} A_i$ and $\bigcap_{i=1}^{\infty} A_i$.

5. (4 points) Show that for an integer n, if $3n + 4$ is even then $n + 1$ is odd.

6. (4 points) Show that the function $f : [0, \infty) \to \mathbb{R}$ given by $f(x) = \dfrac{1 - \sqrt{x}}{1 + \sqrt{x}}$ or $f(x) = x + \sqrt{x}$ is an injective.