Full Name:
Student Number:

TOTAL POINTS: /10

Trent University MATH 2600 - Discrete Structures
Instructor: Aras Erzurumluoğlu

Assignment 2 (due 2:00 pm on Friday, February 7th 2020)

READ ME: Please print this page, write down your name and student number, and attach this page as the cover page to your homework solutions.

When attempting the problems you are allowed to consult any resources such as the lecture notes, textbooks, the internet, etc. In particular, you are encouraged to collaborate and brainstorm with your classmates. However, you are not allowed to copy each other's work (not even partially!).

Each student is required to **submit** a separate solution set by the deadline **to the assignment box in the Mathematics department that has my name on it.**

You are expected to write your solutions in full detail and using a precise mathematical language. You will lose points for imprecise solutions.

Late assignments will not be accepted except for extreme situations.

Problem 1) (3 points): Let $D = E = \{-2, 0, 2, 3\}$. Write negations for each of the following statements and determine which is true, the given statement or its negation. Explain your answer.

(i) $\exists x \in D$ such that $\forall y \in E$, $x + y = y$.

(ii) $\forall x \in D$, $\exists y \in E$ such that $xy \geq y$.

Problem 2) (2 points): Prove (by contraposition) that if $n = ab$, where a and b are positive integers, then $a \leq \sqrt{n}$ or $b \leq \sqrt{n}$.

Problem 3) (2 points): Prove that a set of 5 propositions p_1, p_2, p_3, p_4 and p_5 can be shown to be equivalent by proving that the conditional statements $p_1 \rightarrow p_4$, $p_3 \rightarrow p_1$, $p_4 \rightarrow p_2$, $p_2 \rightarrow p_5$, and $p_5 \rightarrow p_3$ are true.

Problem 4) (2 points): Give an example to show that we cannot distribute an existential quantifier over a conjunction. (See the lecture notes p. 43 for a similar example with the universal quantifier and disjunction.)

Problem 5) (2 points): Prove by contradiction that $5\sqrt{2}$ is an irrational number. (**Hint**: Dividing a rational number by another rational number yields a rational number.)