DISCRETE STRUCTURES, SPRING 2017 - PROBLEM SET 6

Name: _____

Use this worksheet as the cover sheet for your write-up: write your name on this page, and staple this sheet to the front of your homework packet.

You will receive no credit for submitting solutions that the grader cannot read and understand—be sure to write legibly!

Problem 1. Express each statement in one of the forms $P \wedge Q$, $P \vee Q$, or $\neg P$.

(1) There is a quiz scheduled for Wednesday or Friday.
(2) At least one of the numbers x and y equals 0.
(3) (Bonus) Human begins want to be good, but not too good, and not all the time.

Problem 2. Without changing their meanings, convert each of the following sentences having the form "If P, the Q."

(1) A function is rational if it is a polynomial.
(2) Whenever a surface has only one side, it is non-orientable.
(3) You fail only if you stop writing.
(4) Whenever people agree with me, I fee like I must be wrong.

Problem 3. Write a truth table for the logical statements.

(1) $P \vee (Q \implies R)$.
(2) $(Q \vee R) \iff (R \wedge Q)$.
(3) $\neg(P \implies Q)$.

Problem 4. Use the truth table to show that the following statements are equivalent.

(1) $P \wedge (Q \vee R) = (P \wedge Q) \vee (P \wedge R)$.
(2) $(P \implies Q) = (\neg P) \vee Q$.

Problem 5. Decide whether or not the following pairs of statements are logically equivalent. Use Truth tables to determine it.

(1) $(P \wedge Q)$ and $\neg(\neg P \vee \neg Q)$.
(2) $(\neg P) \wedge (P \implies Q)$ and $\neg(Q \implies P)$.

Problem 6. Write each of the following as an English Sentence. Say whether or not the statement is true or false.

(1) $\forall x \in \mathbb{R}, x^2 > 0$.
(2) $\forall x \in \mathbb{R}, \exists n \in \mathbb{N}, x^n > 0$.
(3) $\forall x \in \mathbb{Z}, \exists m \in \mathbb{Z}, m = n + 5$.

Date: March 31st, 2017.