UH - Math 3336 - Dr. Heier - Fall 2019
HW 1
Due Thursday, 08/29, at the beginning of class.

Your solution may be handwritten. Use regular sized sheets of paper, stapled together.

Do not forget to write your name on page 1.

1. Let p, q, r be propositions. Write down a truth table for the following compound propositions.

(a) (0.5 points) $(p \vee q) \vee r$

(b) (0.5 points) $(p \vee q) \wedge r$

(c) (0.5 points) $(p \wedge q) \vee r$

(d) (0.5 points) $(p \wedge q) \wedge r$

(e) (0.5 points) $(\neg p \vee q) \wedge \neg r$

(f) (0.5 points) $(p \vee \neg q) \vee r$

2. (3 points) You are on an island inhabited by two kinds of people: knights and knaves. Knights always tell the truth. Knaves always lie. You meet two people, named A and B. A states, "Both me and B are knights." B states, "A is a knave." What are A and B?

3. (2 points) Professors A, B, and C sit in diner. The server comes and asks, "Does everyone want coffee?" A says, "I don't know." Then B says, "I don't know." Then C says "No, not everyone wants coffee." The server then serves coffee to the professors who want it. How did she figure it out?

4. Let p, q be propositions. Prove the following logical equivalences.

(a) (0.5 points) $p \Leftrightarrow q$ is logically equivalent to $(p \wedge q) \vee (\neg p \wedge \neg q)$

(b) (0.5 points) $\neg(p \Leftrightarrow q)$ is logically equivalent to $p \Leftrightarrow \neg q$

(c) (0.5 points) $\neg(p \text{ XOR } q)$ is logically equivalent to $p \Leftrightarrow q$

(d) (0.5 points) $\neg p \Rightarrow (q \Rightarrow r)$ is logically equivalent to $q \Rightarrow (p \vee r)$