Name: **Section:**

HW 2.2

1. (8 $points$) Suppose n is a fixed integer. Write the negation of the following statement:

   "If n is prime, then n is odd"

2. (22 $points$) Consider the following statement:

   "If it rained today then not only did Sean's car break down, but also he did not go to school"

   a) (5 $points$) Define 3 statement variables $p, q, \& r$, and write the **statement form** of the above conditional statement involving "$\rightarrow$, $\vee$ or $\wedge$" WITHOUT using "$\sim$".

   $p =$

   $q =$

   $r =$

   Statement form:

   b) (7 $points$) Apply the negation "$\sim$" to the statement form found in part a), and ***simplify it*** using logical equivalences laws. Use only one law in each step & include a name for each law.

   c) (10 $points$) Write in words the negation of the conditional statement given at the beginning.

3. (40 *points*) Consider the following statements:
   1. *"If John either came late or did not send recommendation, then he did not get the job"*
   2. *"If John did not get the job, then either he came late or did not send recommendation"*
   3. *"Either John came late or he did not send recommendation, only if he did not get the job"*
   4. *"John did get the job if neither did he come late nor did he not send recommendation"*
   5. *"Not coming late and sending recommendation is necessary for John to get the job"*
   6. *"Coming late and not sending recommendation is sufficient for John to not get the job"*

   a) (15 *points*) Define 3 statement variables $p, q, \& r$ (based on stat. 1.), and write the **statement *form*** of the above 7 statements involving "$\sim, \rightarrow, \vee$ or $\wedge$". In statement *form* for 1, DO NOT USE "$\sim$".

$p =$ Statement *form* for 1

$q =$ Statement *form* for 2

$r =$ Statement *form* for 3

Statement *form* for 4

Statement *form* for 5

Statement *form* for 6

   b) (18 *points*) For each sentence below, fill in
   - the 1st blank with either "$\equiv$" or "$\not\equiv$",
   - the 2nd blank with either "**converse of**", "**inverse of**", "**contrapositive of**", or "**negation of**".
   - and the 3rd blank with the name of supporting logical equivalence law(s) if needed, otherwise write none.

   Note: "S" and "SF" represent "Statement" and "Statement Form" respectively.

S2 ____ S1 because SF2 is the (_____ SF1) by _____

S4 ____ S1 because SF4 is the (_____ SF1) by _____

S5 ____ S1 because SF5 is the (_____ SF1) by _____

   c) (7 *points*) Prove/disprove the following **<u>without</u>** using truth tables: Statement 1 $\equiv$ Statement 6.