MTH 225: Practice Checkpoint

C1

Consider the statement: *If I don't sleep late, I will go to class.* State, in clear English:

1. The hypothesis of the statement
2. The conclusion of the statement
3. The converse of the statement
4. The contrapositive of the statement
5. The inverse of the statement
6. The negation of the statement (Do not just put "not" or "it is not the case that" in front of the statement)

S1

Be sure to *show your work* and please *put a circle or box around each answer*.

1. Convert the base 10 integer 777 to hexadecimal (base 16) using the base conversion algorithm. (On this part, you *must* use the base conversion algorithm and no other method.)
2. Convert the base 8 integer 631 to base 10.
3. Convert the base 2 integer `1110 0001` to base 10.
4. The 8-bit binary representation of the base 10 integer 45 is `0010 1101`. Write the 8-bit binary representation of -22 using two's complement.

S2

1. Add the base-2 integers `10011101` and `01010011`. **Show your work and circle your answer**.
2. Subtract the base-2 integers `10011101 and` `01010011`. **Show your work and circle your answer**.
3. Multiply the base-2 integers `1011` and `110`. **Show your work and circle your answer**.
4. Divide the base-2 integer `10011` by `10`. **Show your work and circle your answers**.

S3

1. Construct a truth table for $p \wedge (q \vee r)$.
2. Construct truth tables for $\neg(p \to q)$ and for $(\neg p) \to (\neg q)$. Based on the truth tables, are these two statements logically equivalent?

Success criteria: All truth tables have the correct number of rows with no duplicated rows. All intermediate columns are shown. No more than three total errors are permitted. (If you make a mistake in an intermediate column but the rest of the row is correct given that mistake, then the mistake only counts once.) The answer about whether the last two statements are logically equivalent is clearly indicated and is consistent with the truth table results.

S4

1. Let P and Q be these two predicates. Assume the domain of each is the set of all natural numbers: $0, 1, 2, 3, 4, \ldots$
   - $P(x)$: x is even
   - $Q(x)$: $x + 2$ is an integer (that is, a whole number)

   For each of the following, state whether the expression is **TRUE** or whether it is **FALSE**.

   (a) $P(2)$

   (b) $Q(9)$

   (c) $\forall x P(x)$

   (d) $\exists x(\neg Q(x))$
2. Consider the statement: *Every problem on this quiz has the same answer.* State the negation of this statement, without merely putting the word "not" or the phrase "it is not the case that" in front of the statement; that is, phrase the negation in terms of another quantified statement.