**Section 1:** Please complete the following problems and turn them in at the beginning of class on Friday.

Problem 1: Complete the truth table for the compound statement \((P \lor (\sim Q)) \Rightarrow ((\sim P) \land R)\).

Problem 2: 2.18 from our book.

Problem 3: Consider the following statements:

R: It is raining.
S: It is sunny.
C: It is cloudy.
W: The ground is wet.

Translate each of the following into formal logical statements.

(1) If it is raining, then the ground is wet.

(2) The ground being wet is necessary for it to be raining.

(3) It is sunny if and only if it is not cloudy.

(4) It is sunny only if it is not raining.

(5) The sky being cloudy is sufficient for rain.

Problem 4: Let \(P\) and \(Q\) be statements. Determine which of the following implies that \(P \lor (\sim Q)\) is false and provide a proof for your answer via a truth table. [Hint: More than one may be correct. You should provide a truth table for each part.]

(1) \(Q \Rightarrow P\) is false.

(2) \(P \land Q\) is true.

(3) \((\sim P) \land Q\) is true.

(4) \(P \Rightarrow Q\) is false.

Problem 5: 2.42 from our book.

Problem 6: 2.54 from our book.
Problem 7: Prove the second DeMorgan Law (the one that we didn’t prove in class) using a truth table and then use it to show that $\sim (P \iff Q)$ is logically equivalent to $(P \land (\sim Q)) \lor (Q \land (\sim P))$ without using truth tables.

Problem 8: 3.2 from our book.

Problem 9: Let $x \in \mathbb{R}$. Prove that if $x - 1 > 0$, then $x^2 - 16 = 0$ has exactly two solutions.

Problem 10: State the negation of each of the following quantified statements.

1. For every $x \in \mathbb{R}$, $x^3 > 0$.
2. There exists a rational number $r$ such that $r^2$ is irrational.
3. For every real number $x$ there exists a real number $y$ such that $\frac{x}{y} < 1$.
4. There exists sets $A$ and $B$ such that $A \subset B$.
5. For every $x \in [0, 1]$ there exists $N \in \mathbb{N}$ such that for all $n \geq N$, $x^n < 1$.

Section 2: Your quiz on Friday will be taken from the problems in this section.

2.20, 2.24, 2.36, 2.52, 2.58 (a), 2.68, 2.78, 3.6

Section 3: These are extra practice problems.

2.15, 2.22, 2.23, 2.29, 2.41, 2.51, 2.60, 2.63, 2.64, 2.72, 3.4