Suggested reading for this week (from the textbook): §2.2

Study items for PSet 3:

- Truth tables, and their use in proving tautologies or that logical expressions are equivalent.

- Proving biconditionals in two parts ("$\Rightarrow$" ... " $\Leftarrow$")

- Direct proofs

- Indirect proofs: the distinction between proofs by contradiction and proof by contrapositive.

Problems from the book: (First two numbers refer to the section number. The phrase in parentheses is just a brief summary to remind you which problem is about what when you scan this sheet later.)

- 1.4.6 (prove distributivity of $\wedge$ over $\vee$ via truth table)

- 1.4.9 (verify a tautology via truth table.)

  NOTE: a "tautology" is a logical expression that is always True, regardless of the truth values of the individual propositions.

- 1.4.12 (does parenthesis placement matter with $\vee$ and $\wedge$?)

- 1.5.5 (generalized de Morgan laws)

- 1.6.11 (Truth tables with implications; four parts)

- 2.1.6 (biconditional about a polynomial)

- 2.1.8 ($n^3 + n$ is always even)

- 2.1.9(a) (sums of three consecutive integers)

- 2.1.13 (sum of rational and irrational)

- 2.1.16 ($\sqrt[3]{2} \notin \mathbb{Q}$)

Supplemental problems:

1. Prove that $(P \wedge Q) \Rightarrow R$ is logically equivalent to $P \wedge \sim R \Rightarrow \sim Q$.

2. (a) Let $m \in \mathbb{Z}$. Prove that either $m^2 = 4k$, with $k \in \mathbb{Z}$, or $m^2 = 4k + 1$, with $k \in \mathbb{Z}$.
   (b) Let $a, b, c \in \mathbb{Z}$. Prove that if
   $$a^2 + b^2 = c^2,$$
   then at least one of a and b is even. *(Hint: Use part a))*