Directions:

- Print out this piece of paper and use it as a cover sheet. Write your name in the upper right hand corner.
- Your homework should be stapled and each problem should occur in order.
- Do not hand in scratch work.¹ The final version of your solution to each problem should be collocated and stapled.
- Always label every plot (if you have any). For example, you should include titles, x-labels, y-labels, and legends.
- 1. Read Chapter 2, sections 4–11.
- 2. Construct a truth table for each of the following compound statements.
 - (a) $P \lor \neg Q$
 - (b) $\neg (P \implies Q)$
 - (c) $(P \land Q) \lor (\neg P \land Q)$
 - (d) $(P \land Q) \lor (P \land R)$
 - (e) $[(P \implies Q) \land (Q \implies R)] \implies (P \implies R)$
- 3. The purpose of this problem is to discover that "If ..., then ..." statements can be written in multiple ways. Consider the following statements:
 - P : It is raining.
 - Q : It is cloudy.
 - (a) Write the conditional statement $P \implies Q$ in English using "If" and "Then".
 - (b) Write the conditional statement $P \implies Q$ using the word "because."
 - (c) Write the conditional statement $P \implies Q$ using the word "necessary."
 - (d) Write the conditional statement $P \implies Q$ using the word "sufficient."
- 4. Show that the following compound statements are logically equivalent by constructing their truth tables.

(a)
$$(P \implies Q) \equiv (\neg P \lor Q)$$

(b) $\neg (P \lor Q) \equiv (\neg P \land \neg Q)$
(c) $[P \lor (Q \lor R)] \equiv [(P \lor Q) \lor R]$
(d) $[P \lor (Q \lor R)] \equiv [(P \lor Q) \lor R]$
(e) $(P \implies Q) \equiv [P \implies (P \land Q)]$
Section 2.5: 2.30

- 6. Section 2.6: 2.35, 2.39, 2.41
- 7. Section 2.7: 2.46

5.

8. Section 2.8: 2.51, 2.56

¹Yes, doing math will require a lot of scratch work! You will rarely be able to correctly answer each question on your first try. For each problem, figure out what the solution is, and then write-up a *final draft* that you hand in.