Instructions: All assignments are due by **midnight** on the due date specified. Every student must write up their own solutions in their own manner.
Please present your solutions in a clean, understandable manner. Use the provided files that give mathematical notation in Word, Open Office, Google Docs, and LaTeX.
Assignments should be typed and submitted as a PDF.
You should complete all problems, but only a subset will be graded (which will be graded is not known to you ahead of time).

Graphs

1. (3 points) Rosen Ch 10.5 #56, p. 707.
2. (2 points) Rosen Ch 10.5 #58(a), p. 707.
3. (2 points) Rosen Ch 10.7 #14, p. 725.
4. (2 points) Rosen Ch 10 Supplementary Exercises #19, p. 739.
5. (2 points) Rosen Ch 10 Supplementary Exercises #20, p. 739.
6. (2 points) Rosen Ch 10 Supplementary Exercises #22, p. 739.

Logic

7. (34 points) Prove the following statement is a tautology without using truth tables (use the logical equivalences from Table 6-8 of the book). Justify each step with the law used. Model the solutions in the style of Examples 6-8, pp. 29-30 of the book.
   (a) (6 points) $p \to (\neg q \to r) \equiv \neg(q \vee r) \to \neg p$
   (b) (8 points) $p \to (q \vee r) \equiv (p \wedge \neg q) \to r$
   (c) (10 points) $[\neg p \wedge (p \vee q)] \to q \equiv \mathbf{T}$
   (d) (10 points) $[(p \vee q) \wedge (p \to r) \wedge (q \to r)] \to r \equiv \mathbf{T}$
8. (8 points) Show the following expressions are logically equivalent.

   If you are not lazy, then you work hard or you are clever and lazy.

   You work hard or you are lazy.

   Use the following propositions to represent the concepts in the expression. Let
   - l be "you are lazy"
   - w be "you work hard"
   - c be "you are clever"
9. (8 points) Rosen Ch 1.6 #6, p. 78.
   Let r be the proposition "It rains", let f be "It is foggy", let s be "The sailing race will be held", let l be "The life saving demonstration will go on", and let t be "The trophy will be awarded".
10. (2 points (bonus)) Give a compound proposition with three variables p, q, and r that is true when at most one of the three variables is true, and false otherwise.