Reading: 1.1, 1.3 of Rosen, class notes.

Problems:

1. Which of these are propositions? What are the truth values of those propositions?
   (a) Antananarivo is the capital of Madagascar.
   (b) The moon is made of Swiss cheese.
   (c) $2^n \geq 100$

2. Form a negation of each of the following propositions.
   (a) There is no pollution in New Jersey.
   (b) $2 + 1 = 3$
   (c) The summer in Maine is hot and sunny.

3. Let P and Q be the propositions
   P: You drive over 65 miles per hour. Q: You get a speeding ticket.
   Express the following propositions in terms of P and Q and logical connectives.
   (a) You do not drive over 65 miles per hour.
   (b) You drive over 65 miles per hour, but you do not get a speeding ticket.
   (c) You will get a speeding ticket if you drive over 65 miles per hour.
   (d) Whenever you get a speeding ticket, you are driving over 65 miles per hour.

4. Let P, Q, and R be the propositions
   P: You have the flu. Q: You miss the final examination. R: You pass the course.
   Express the following propositions as an English sentence.
   (a) $\neg Q \leftrightarrow R$
   (b) $(P \land Q) \lor (\neg Q \land R)$

5. Let P, Q, and R be the propositions
   P: Grizzly bears have been seen in the area. Q: Hiking is safe on the trail.
   R: Berries are ripe along the trail.
   Express the following propositions in terms of P, Q, and R and logical connectives.
   (a) Grizzly bears have not been seen in the area and hiking on the trail is safe, but berries are ripe along the trail.
   (b) It is not safe to hike on the trail, but grizzly bears have not been seen in the area and berries along the trail are ripe.

6. Form a truth table for each of the following propositions.
   (a) $P \rightarrow \neg P$
   (b) $P \oplus (P \lor Q)$
   (c) $(P \land Q) \rightarrow (P \land Q)$

7. Jack’s prison cell has two unmarked exits, each guarded by a soldier. One exit is an escape and the other one surely leads to a guillotine. The guards are a knight and a knave. Unaware which guard to trust, Jack is allowed to ask one of them a single yes/no question. What question should he ask?