Selected answers to Rosen exercises 1.1

1. e) “\(x + 2 = 11\)” is not a proposition

3. d) Negation of “The summer in Maine is hot and sunny.” is “The summer in Maine is not hot or it is not sunny.”

5. p : “Swimming at the New Jersey shore is allowed.” and q : “Sharks have been spotted near the shore.”
   h) \(\neg p \land (p \lor \neg q)\):
   “Swimming at the New Jersey shore is not allowed, and either swimming at the New Jersey shore is allowed or sharks have not been spotted near the shore.”

7. p : “It is below freezing.” q : “It is snowing.”
   f) “It is either below freezing or it is snowing, but it is not snowing if it is below freezing.” :
   \((p \lor q) \land (p \land \neg q)\)
   g) “That it is below freezing is necessary and sufficient for it to be snowing.” :
   \(p \rightarrow q\)

   g) “Whenever you get a speeding ticket, you are driving over 65 miles per hour.” :
   \(q \rightarrow p\)

11. p : “Grizzly bears have been seen in the area.” q : “Hiking is safe on the trail.”
    r : “Berries are ripe along the trail.”
    a) “Berries are ripe along the trail, but grizzly bears have not been seen in the area.
    \(r \land \neg p\)
    b) “Grizzly bears have not been seen in the area and hiking on the trail is safe, but berries are ripe along the trail.” \((\neg p \land q) \land r\)
    c) “If berries are ripe along the trail, hiking is safe if and only if grizzly bears have not been seen in the area.”
    \(r \rightarrow (q \leftrightarrow \neg p)\)
    d) “It is not safe to hike on the trail, but grizzly bears have not been seen in the area and the berries along the trail are ripe.”
    \(\neg q \land (\neg p \land r)\)
    e) “For hiking on the trail to be safe, it is necessary but not sufficient that berries not be ripe along the trail and for grizzly bears not to have been seen in the area.”
    \((q \rightarrow (\neg r \land \neg p)) \land (\neg r \land \neg p) \rightarrow q\)
    f) “Hiking is not safe on the trail whenever grizzly bears have been seen in the area and berries are ripe along the trail.”
    \((p \land r) \rightarrow \neg q\)