Practice: Propositional Logic 1

Instructions: Complete each of the following as practice.

1. Using the dictionary below, translate the following English statements into the formal propositional language.

   A : Amy can pitch a tent.
   B : Amy can go camping.
   C : Amy likes to go fishing.
   D : Amy knows how to build a campfire.

   (a) If Amy can pitch a tent, then she can go camping.
   (b) If Amy likes to go fishing, then she knows how to build a campfire but cannot go camping.
   (c) If Amy does not know how to build a campfire but can pitch a tent, then either Amy does not like to fish or she can go camping.
   (d) If Amy does not like to fish, then either Amy can pitch a tent or she knows how to build a campfire.
   (e) Amy does not like to fish but she can pitch a tent and knows how to build a campfire.

2. Using the dictionary from Question 1, translate the following formal statements into English.
   (a) $A \implies (B \vee (\neg C))$
   (b) $A \iff D$
   (c) $(A \wedge (\neg C)) \vee (C \wedge (\neg B))$
   (d) $B \implies (A \wedge C)$
   (e) $A \wedge (\neg(B \vee D))$

3. Create a truth table for each of the following propositional statements.
   (a) $\neg(\neg P)$
   (b) $(P \implies Q) \implies (Q \implies P)$
   (c) $(Q \iff (\neg P)) \vee P$
   (d) $((P \implies Q) \wedge P) \implies Q$
   (e) $(P \vee Q) \implies (P \implies Q)$
   (f) $(P \implies Q) \implies Q$
   (g) $(P \oplus Q) \wedge (P \iff Q)$
   (h) $(P \implies Q) \iff ((\neg P) \vee Q)$
   (i) $((P \implies Q) \wedge (\neg P)) \implies (\neg Q)$
   (j) $(P \vee (\neg P)) \oplus (P \implies Q)$
   (k) $P \implies (Q \vee R)$
   (l) $((P \implies Q) \wedge (Q \implies R)) \iff (P \implies R)$
   (m) $((P \oplus Q) \oplus R) \iff (P \oplus (Q \oplus R))$
   (n) $(\neg(P \vee Q)) \wedge (R \implies P)$
   (o) $((P \implies Q) \implies (Q \implies R)) \implies (P \implies R)$