Homework 2 - Chapter 1

1. (1 point) The conditional statements below are:
i) $(p \land q) \rightarrow p$
ii) $p \rightarrow (p \lor q)$

*a. Logically equivalent
b. Not logically equivalent
c. Do not have a relation
d. Cannot be compared

2.(1 point) Let p and q be the propositions
p = "You drive over 65 miles per hour."
q = "You get a speeding ticket."
Write these propositions using p and q and logical connectives (including negations).
If you do not drive over 65 miles per hour, then you will not get a speeding ticket.
*a. $\neg p \rightarrow \neg q$
b. $\neg p$ ^ $\neg q$
c. $\neg p$ v $\neg q$
d. $\neg p \rightarrow \neg q$

3. (1 point) The conditional statement are:
$(p \rightarrow q) \rightarrow r$ and $p \rightarrow (q \rightarrow r)$
a. Logically equivalent
*b. Not logically equivalent
c. Do not have a relation
d. Cannot be compared

4.(1 point) In the following proposition
$\neg p \rightarrow \neg q$
a. p is the conclusion and q is the premise
b. not p is the consequent and not q is the conclusion
c. p is an hypothesis and not q is the conclusion
*d. not p is the antecedent and not q is the consequent

5. (1 points) How can the following English sentence be translated into a logical expression?
“Mary is nice; and it is Monday implies that Bob is tired.”
Let p = It is Monday

q = Mary is nice
t = Bob is tired
a. $((q \land p) \rightarrow \neg t)$
b. $((q \land p) \rightarrow t)$
c. $(q \rightarrow t)$
*d. $(q \land (p \rightarrow t))$

6. (1 point) Which statement best captures in logic the English sentence, "Somewhere, somebody done somebody wrong?"
a. $\forall x \exists y \forall z (W(x, y, z))$
*b. $\exists x \exists y \exists z (W(x, y, z))$
c. $\exists x \forall y \forall z (W(x, y, z))$
d. $\forall x \forall y \forall z (W(x, y, z))$

7. (1 point) Which of the following is a logical equivalence?
a. $(p \rightarrow q) \equiv p \land \neg q$
b. $\neg(p \rightarrow q) \equiv p \lor \neg q$
c. $\neg(p \rightarrow q) \equiv p \land q$
*d. None of the above

8. (1 point) Which of the following is a tautology?
*a. $(\neg r \land (q \rightarrow r)) \rightarrow \neg q$
b. $(r \land (q \rightarrow r)) \rightarrow q$
c. $(r \land (q \rightarrow r)) \rightarrow \neg q$
d. $(\neg r \land (\neg q \rightarrow r)) \rightarrow \neg q$

9. (1 point) Let W(x, z) mean that student x has visited website y,
where the domain for x and y consists of all students in your
school and the domain for z consists of all websites.
Which of the following expresses that there are two different people who have visited exactly the same websites ?
a. $\forall x \exists y \exists z((x = y) \land (W(x, z) \leftrightarrow W(y, z)))$
b. $\forall x \forall y \forall z((x != y) \land (W(x, z) \leftrightarrow W(y, z)))$
c. $\exists x \exists y \forall z((x = y) \land (W(x, z) \leftrightarrow W(y, z)))$
*d. $\exists x \exists y \forall z((x != y) \land (W(x, z) \leftrightarrow W(y, z)))$

10. (1 point) Let L(x, y) be the statement “x loves y,” where the domain
for both x and y consists of all people in the world.
Which of the following English statements expresses this formal logic?

$\exists x(\forall y L(y, x) \land \forall z((\forall w L(w, z)) \rightarrow z = x))$

*a. There is exactly one person whom everybody loves.
b. There is somebody whom no one loves.
c. There are exactly two people whom everyone loves.
d. Everyone loves himself or herself.

11. (1 point) A theorem is a:
a. statement that is always true
b. false statement
*c. statement that can be proven to be true
d. proof

12. (1 point) Indirect proofs make use of the following:
a. $p \land p \Leftrightarrow p$
b. $p \rightarrow q \Leftrightarrow \sim p \lor q$
c. $p \lor T \Leftrightarrow T$
*d. $p \rightarrow q \Leftrightarrow \sim q \rightarrow \sim p$

13. (1 point) A proof that proves a theorem by checking every possibility is called a/an:
a. Proof by contradiction
*b. Exhaustive proof
c. Proof by contraposition
d. Irrational proof

14. (1 point) A direct proof of a conditional statement $p \rightarrow q$ assumes:
a. p and q both are true
b. q is true so then p must be true
*c. p is true so then q must be true
d. p and q both are false