2, 14, 24, 32, 36

2. Which of these are propositions? What are the truth values of those that are propositions?
a) Not a proposition
b) Not a proposition
c) There are no black flies in Maine. – False
d) Not a proposition
e)The moon is made of green cheese. – False
f) Not a proposition

14. Let p, q, and r be the propositions
p:You get an A on the final exam.
q:You do every exercise in this book.
r:You get an A in this class.
Write these propositions using p, q, and r and logical connectives (including negations).
a) You get an A in this class, but you do not do every exercise in this book.
   R ^ ~Q
b) You get an A on the final, you do every exercise in this book, and you get an A in this class.
   P ^ Q ^ R
c) To get an A in this class, it is necessary for you to get an A on the final.
   R -> P
d) You get an A on the final, but you don't do every exercise in this book; nevertheless, you get an A in this class.
   P ^ ~Q ^ R
e) Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class.
   (P^Q) -> R
f) You will get an A in this class if and only if you either do every exercise in this book or you get an A on the final
   R <-> (P v Q)

24. Write each of these statements in the form "if p , then q" in English. [Hint: Refer to the list of common ways to ex-press conditional statements provided in this section.]
a) I will remember to send you the address only if you send me an e-mail message.
   P: I will remember to send you the address
   Q: If you send me an email message
   P - > Q
If you send me an email message, then I will remember to send you the address.
b) To be a citizen of this country, it is sufficient that you were born in the United States.
   P: A citizen of this country
   Q: You were born in the United States
   Q -> P
If you were born in the United States, then you are a citizen of this country.
c) If you keep your textbook, it will be a useful reference in your future courses.
   P: Keep your textbook
   Q: It will be a useful reference in future courses
   P -> Q
If you keep your textbook, then it will be a useful reference in future courses.
d) The Red Wings will win the Stanley Cup if their goalie plays well.
   P: Red Wings will win the Stanley Cup
   Q: Their goalie plays well
   Q -> P
If their goalie plays well, then the Red Wings will win the Stanley Cup.
e) That you get the job implies that you had the best credentials.

P: You get the job
Q: You had the best credentials
P -> Q

If you get the job, then you had the best credentials.

f) The beach erodes whenever there is a storm.

P: The beach erodes
Q: There is a storm
Q -> P

If there is a storm, then the beach erodes.

g) It is necessary to have a valid password to log on to the server.

P: Have a valid password
Q: Log onto the server
Q -> P

If you log onto the server, then you have a valid password.

h) You will reach the summit unless you begin your climb too late. ****************CHECK***************

P: You will reach the summit
Q: You begin your climb late
~Q -> P

If you do not begin your climb too late, then you will reach the summit.

32. Construct a truth table for each of these compound propositions: ********

a) $p \rightarrow \neg p$

P	~p	p->~p
T	F	F
F	T	T

b) $p \leftrightarrow \neg p$

P	~p	p<->~p
T	F	F
F	T	F

c) $p \oplus (p \vee q)$

p	q	pvq	p⊕(pvq)
T	T	T	F
T	F	T	F
F	T	T	T
F	F	F	F

d) $(p \wedge q) \rightarrow (p \vee q)$

p	q	p^q	pvq	(p^q)->(pvq)
T	T	T	T	T
T	F	F	T	T
F	T	F	T	T
F	F	F	F	T

e) $(q \rightarrow \neg p) \leftrightarrow (p \leftrightarrow q)$

q	p	~p	q->~p	p<->q	(q→¬p)↔(p↔q)
T	T	F	F	T	F
T	F	T	T	F	F
F	T	F	T	F	F
F	F	T	T	T	T

f) (p↔q)⊕(p↔¬q)

p	q	~q	p<->q	p<->~q	(p↔q)⊕(p↔¬q)
T	T	F	T	F	T
T	F	T	F	T	T
F	T	F	F	T	T
F	F	T	T	F	T

36. Construct a truth table for each of these compound propositions.

a) (p∨q) ∨ r

p	q	r	pvq	(pvq) v r
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	T	T
F	T	T	T	T
F	T	F	T	T
F	F	T	F	T
F	F	F	F	F

b) (p ∨ q) ∧ r

p	q	r	pvq	(pvq)^r
T	T	T	T	T
T	T	F	T	F
T	F	T	T	T
T	F	F	T	F
F	T	T	T	T
F	T	F	T	F
F	F	T	F	F
F	F	F	F	F

c) (p ∧ q) ∨ r

p	q	r	p^q	(p^q) v r
T	T	T	T	T
T	T	F	T	T
T	F	T	F	T
T	F	F	F	F
F	T	T	F	T
F	T	F	F	F
F	F	T	F	T
F	F	F	F	F

d) (p ∧ q) ∧ r

p	q	r	p^q	(p^q)^r
T	T	T	T	T
T	T	F	T	F
T	F	T	F	F
T	F	F	F	F
F	T	T	F	F
F	T	F	F	F
F	F	T	F	F

F	F	F	F	F

e) (p ∨ q) ∧ ¬r

P	q	r	~r	pvq	(pvq)^~r
T	T	T	F	T	F
T	T	F	T	T	T
T	F	T	F	T	F
T	F	F	T	T	T
F	T	T	F	T	F
F	T	F	T	T	T
F	F	T	F	F	F
F	F	F	T	F	F

f) (p ∧ q) ∨ ¬r

P	q	r	~r	P^q	(p^q)v~r
T	T	T	F	T	T
T	T	F	T	T	T
T	F	T	F	F	F
T	F	F	T	F	T
F	T	T	F	F	F
F	T	F	T	F	T
F	F	T	F	F	F
F	F	F	T	F	T