Rosen 1.1, Exercise 8(d,f):

8(d) answer: I bought a lottery ticket this week and I won the million dollar jackpot.

8(f) answer: If I had not bought a lottery ticket this week, then I would not have won the million dollar jackpot.

Student's work goes here

p : I bought a lottery ticket this week.
q : I won the million dollar jackpot.

8(d): p $\wedge$ q
I bought a lottery ticket this week $\wedge$ I won the million dollar jackpot
$\wedge$ = and
I bought a lottery ticket this week and I won the million dollar jackpot.

8(f): $\neg p \to \neg q$
$\neg$ I bought a lottery ticket this week $\to$ $\neg$ I won the million dollar jackpot
I did not buy a lottery ticket this week $\to$ I did not win the million dollar jackpot
If I had not bought a lottery ticket this week, then I would not have won the million dollar jackpot.

Rosen 1.1, Exercise 22(e):

> If you can access the website, then you pay a subscription fee.

Student's work goes here

p: You can access the website
q: you pay a subscription fee

You can access the website only if you pay a subscription fee.
$p \rightarrow q$
If you can access the website, then you pay a subscription fee.

Rosen 1.1, Exercise 28(b):

Converse ($q \to p$): If I go to the beach, then it is a sunny summer day.

Contrapositive ($\neg q \to \neg p$): If I do not go to the beach, then it is not a sunny summer day.

Inverse ($\neg p \to \neg q$): If it is not a sunny summer day, then I do not go to the beach.

Student's work goes here

I go to the beach whenever it is a sunny summer day.
q whenever p

p $\to$ q: If it a sunny summer day, then I go to the beatch

Rosen 1.1, Exercise 36(e):

p	q	r	$\neg r$	$(p \vee q)$	$(p \vee q) \wedge \neg r$
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

Student's work goes here

Rosen 1.1, Exercise 42(d):

$\boxed{x = 1}$

Student's work goes here

if(x+1=2)XOR(x+2=3)thenx:=x+1
p: x+1=2
q: x+2=3

for x = 1:
p = T
q = T
p $\otimes$ q = F

x remains unchanged so x = 1

Rosen 1.2, Exercise 6:

$$\boxed{u \rightarrow (b_{32} \wedge g_1 \wedge r_1 \wedge h_{16}) \vee (b_{64} \wedge g_2 \wedge r_2 \wedge h_{32})}$$

Student's work goes here

Part 1:
You can upgrade your operating system only if you
u $\rightarrow$

Part 2:
have a 32-bit processor running at 1 GHz or faster, at least 1 GB RAM, and 16 GB free hard disk space,
$b_{32} \wedge g_1 \wedge r_1 \wedge h_{16}$

Part 3:
or a
$\vee$

Part 4:
64- bit processor running at 2 GHz or faster, at least 2 GB RAM, and at least 32 GB free hard disk space.
$b_{64} \wedge g_2 \wedge r_2 \wedge h_{32}$

$u \rightarrow (b_{32} \wedge g_1 \wedge r_1 \wedge h_{16}) \vee (b_{64} \wedge g_2 \wedge r_2 \wedge h_{32})$

Rosen 1.2, Exercise 18:

Invite Jasmine and Kanti but do not invite Samir. Invite Jasmine only. Invite none of them

Student's work goes here

Jasmine: j
Kanti: k
Samir: s

Jasmine will only attend when Samir is not there
$j \to \neg s$
Samir will only attend if Kanti is there
$\neg k \to \neg s$
Kanti will not attend without Jasmine
$\neg j \to \neg k$

Samir will only attend if Kanti is there but Kanti will only attend if Jasmine is there and Jasmine will not attend with Samir so Samir cannot attend.
$s \to k \to j \to \neg s$
creates an impossible loop

Jasmine can attend as long as Samir does not so she can attend either alone or with Kanti.

Kanti can only attend with Jasmine so it leaves only two possibilities.

Two options are either Jasmine attending alone, or Jasmine and Kanti attending together, with the third being inviting none of them.

Rosen 1.2, Exercise 40(b):

$\boxed{\neg((\neg p \wedge q) \vee p)\text{: Will only return true if both p and q are false}}$

Student's work goes here

Starting left to right

Part 1:
$\neg p$

Part 2:
$\neg p \wedge q$

Part 3:
$(\neg p \wedge q) \vee p$

Part 4:
$\neg((\neg p \wedge q) \vee p)$

p	q	$\neg p$	$\neg p \wedge q$	$(\neg p \wedge q) \vee p$	$\neg((\neg p \wedge q) \vee p)$
T	T	F	F	T	F
T	F	F	F	T	F
F	T	T	T	T	F
F	F	T	F	F	T

EXTRA CREDIT: Rosen 1.2, Exercise 36(a):

$\boxed{\text{John did it.}}$

Student's work goes here

Alice: a
John: j
Carlos: c
Diana: d

Alice said Carlos did it: c
John said he did not do it: ¬ j
Carlos said Diana did it: d
Diana said she did not do it: ¬ d

The first section is the statements by the 4 people while the second is whether that person did it or not with the default being false and the third is if there is only one suspect

c	$\neg j$	d	$\neg d$	a	j	c	d	$a \otimes j \otimes c \otimes d$
T	F	F	F	F	T	T	-	F
F	T	F	F	F	F	F	-	F
F	F	T	F	F	T	F	T	F
F	F	F	T	F	T	F	F	T

The first and second rows have issues with both Carlos and Diana lying and result in a contradiction for Diana which means that such situations are impossible and these two rows can therefore be eliminated.

The third row returns that both John and Diana were responsible and while this is possible, for the sake of this problem being under the assumption that there is only one person guilty, it can be eliminated.

Only the fourth row provides a single suspect so we can assume that this is the correct situation which would make John the one who did it.