4. (2 points) Negate the proposition If the sky is blue, then the pillow is soft. without using the words "It is not the case that ...." (Hint: Your answer should include the word AND)

What I am using: $\neg(p \to q) \equiv p \wedge \neg q$

The sky is blue and pillow is not soft.

5. (2 points each) Given that p and q are true, r and s are false. Determine the truth value of each proposition below.

(a) $\neg p \to (q \vee r) \equiv [F \to \text{whatever}] \equiv T$

(b) $\neg(p \vee \neg q) \leftrightarrow (r \wedge s) \equiv [\neg(T \vee F) \leftrightarrow (F \wedge F)] \equiv [F \leftrightarrow F] \equiv T$

(c) $p \to (q \to r) \equiv T \to (T \to F) \equiv T \to F \equiv F$

6. (5 points each) Determine whether each argument below is valid and justify your answer.

(a)
$p \to (q \vee r)$
$p \wedge \neg q$
$r \vee q$
$\therefore q$

Don't forget!

Invalid. Counter-example:
Choose $p = T$ $q = F$ $r = T$
All hypotheses are true. But the conclusion is false.

(b)
p
$p \to q$
$\neg q \vee r$
$\therefore r$

Valid. Since p is true and $p \to q$ is true, q must be true. Thus $\neg q$ is false.
If $\neg q$ is false and $\neg q \vee r$ is true, r must be true.

Alternately, see truth table on the next page.