Logic 3: Conditional Statements

Rewrite the statements in If then form

1. This loop will repeat exactly N times if it does not contain a **stop** or a **go to.**
2. I am on time for work if I catch the bus.
3. Freeze or I'll shoot.
4. Fix my ceiling or I won't pay my rent.

Construct the truth table for each statement:

5. $\sim p \vee q \rightarrow \sim q$

6. $p \vee (\sim p \wedge q) \rightarrow q$

7. $p \wedge \sim q \rightarrow r$

8. $\sim p \vee q \rightarrow r$

9. Use the fact that $p \vee q \rightarrow r \equiv (p \rightarrow r) \wedge (q \rightarrow r)$ to rewrite the following statement:

If $x > 2$ or $x < -2$, then $x^2 > 4$

10. Use a truth table to verify that:
a. $p \rightarrow q \equiv \sim p \vee q$
b. $\sim (p \rightarrow q) \equiv p \wedge \sim q$

11. Write the negation, converse, inverse and contrapositive for each statement.

a. If P is a square, then P is a rectangle.
b. If today is Thanksgiving, then tomorrow is Friday.
c. If *r* is rational, then the decimal expansion of *r* is repeating.
d. If *n* is prime, then *n* is odd or *n* is 2.
e. If *x* is nonnegative, then *x* is positive or *x* is 0.

12. "Do you mean that you think you can find out the answer to it?" said the March Hare. "Exactly so," said Alice. "Then you should say what you mean," the March Hare went on. 'I do,' Alice hastily replied; "at least--at least I mean what I say--that's the same thing, you know." "Not the same thing a bit!" said the Hatter. " Why, you might just as well say that 'I see what I eat' is the same thing as 'I eat what I see'!"

-from *Alice in Wonderland,* by Lewis Carroll

The Hatter is correct. "I say what I mean" is not the same thing as " I mean what I say". Rewrite each statement in If-Then form and explain the logical relation between them.