LOGIC: STATEMENTS, CONNECTIVES, QUANTIFIERS [PIRNOT 3.1]

EX 3.1.1: Let statements $P \equiv$ "The TV is working"
$Q \equiv$ "It is snowing outside"
$R \equiv$ "$3 + 6 = 9$"

Express the following English statements symbolically (i.e. in terms of P, Q, R):

(a) "The TV is working and it is snowing outside."

(b) "$3 + 6 = 9$ or $3 + 6 \neq 9$."

(c) "If $3 + 6 \neq 9$, then it is not snowing outside."

(d) "The TV is working if and only if it is not snowing outside or $3 + 6 = 9$."

EX 3.1.2: Let statements $P \equiv$ "The sky is cloudy"
$Q \equiv$ "It is not true that your car is red"
$R \equiv$ "One does not work hard"

Express each symbolic statement in English:

(a) $P \wedge Q$

(b) $(\sim P) \vee P$

(c) $(Q \ \wedge (\sim R)) \longrightarrow (\sim P)$

(d) $((\sim Q) \ \vee (\sim P)) \longleftrightarrow R$

EX 3.1.3: Negate the following quantified statements (in English):

(a) "Some cats have sharp claws."

(b) "All houses are expensive."

(c) "No phones are cheap."

(d) "Some cars are not fast."