Chapter 1 : Sentential Logic

1.1 : Deductive Reasoning and Logical Connectives

Exercise 1:

(a) $(R \vee H) \wedge \neg(H \wedge T)$

(b) $\neg S \vee (S \wedge \neg P)$

(c) $\neg(\sqrt{7} < 2) \wedge \neg(\sqrt{7} = 2)$

Exercise 2:

(a) $(J \wedge B) \vee (\neg J \wedge \neg B)$

(b) $(F \vee C) \wedge \neg(F \wedge P)$

(c) $(3 \mid 6) \wedge (3 \mid 9) \wedge (3 \mid 15)$

Exercise 3:

(a) $\neg(A \wedge B)$

(b) $\neg A \wedge \neg B$

(c) $\neg A \vee \neg B$

(d) $\neg(A \vee B)$

Exercise 4:

(a) $(RT \wedge ET) \vee (RH \wedge EH)$

(b) $(RT \vee RH) \wedge (ET \vee EH)$

(c) $\neg(RT \vee RH) \wedge \neg(ET \vee EH)$

(d) $\neg[(RT \wedge RH) \vee (ET \wedge EH)]$

Exercise 5:

(a) WFF

(b) Not WFF

(c) WFF

(d) Not WFF

Exercise 6:

(a) It is not the case that I will both buy the pants and not buy the shirt.
(b) I will not buy the pants and I will not buy the shirt.
(c) I will not buy the pants or I will not buy the shirt.

Exercise 7:

(a) Steve or George is happy, but not both.
(b) Steve is happy, George isn't happy, or George is happy and Steve isn't.
(c) George is happy and Steve isn't.

Exercise 8:

(a) Taxes or the deficit will go up
(b) Taxes + Deficit won't both go up, but one of them will.
(c) Either only taxes will go up, or only the deficit will go up.

Exercise 9:

(a) $\neg(J_M \wedge P_M)$
$(P_C \vee P_M)$
J_M
$\therefore P_C$ $\Rightarrow$ VALID

(b) $B \vee F$
$P \vee C$
$\neg(F \wedge C)$
$\therefore \neg(B \wedge P)$ $\Rightarrow$ INVALID

(c) $J \vee B$
$\neg S \vee \neg B$
$\therefore J \vee \neg S$ $\Rightarrow$ INVALID

(d) $(S \wedge H) \vee (E \wedge \neg H)$
$\therefore \neg(S \wedge E)$ $\Rightarrow$ INVALID