Homework 2

2.1

6) S = stocks are increasing i = interest rates are steady

a) $S \wedge i$ b) $\sim S \wedge \sim i$

10) Let p be the statement "DateEndFlag is off"

q = "Error = 0 r = "Sum < 1,000

c) Dateflag is off ~~but~~ however Error $\neq 0$

or Sum $\geq$ 1,000 $p \wedge (\sim q \vee \sim r)$

12) Truth Tables $\sim p \wedge q$

p	q	$\sim p$	$\sim p \wedge q$
T	T	F	F
T	F	F	F
F	T	T	T
F	F	T	F

14) $p \wedge (q \wedge r)$

p	q	r	$q \wedge r$	$p \wedge (q \wedge r)$
T	T	T	T	T
T	T	F	F	F
T	F	T	F	F
T	F	F	F	F
F	T	T	T	F
F	T	F	F	F
F	F	T	F	F
F	F	F	F	F

16) $P \vee (P \wedge Q)$ and P

P	Q	$P \wedge Q$	P
T	T	T	T
T	F	F	T
F	T	F	F
F	F	F	F

18) $P \vee t$

P	t	$P \vee t$
T	T	T
F	T	T

27) The connector is loose or the machine is unplugged
The connector isn't loose and the machine isn't unplugged

34) Negations
$x < 2$ or $x > 5$
$2 \leq x \leq 5$

40) Truth Tables $(P \wedge Q) \vee (\sim P \vee (P \wedge \sim Q)) \equiv$

PQ	$\sim P$	$\sim Q$	$P \wedge Q$	$P \wedge \sim Q$	$\sim P \vee (P \wedge Q)$	T
TT	F	F	T	F	T	T
TF	F	T	F	T	T	T
FT	T	F	F	F	T	T
FF	T	T	F	F	T	T

4b) $(P \wedge \sim q) \vee (P \wedge q) \equiv P \wedge (\sim q \vee q)$ by Distributive

$\equiv P \wedge (q \vee \sim q)$ by commutative law for $\vee$

$\equiv P \wedge t$ by negation law for $\vee$

$\equiv P$ by Identity law for $\wedge$

5a) logical equivalences

$(P \wedge \sim q) \vee P \equiv P$

$(P \wedge \sim q) \vee P \equiv P \vee (P \wedge \sim q)$ commutative law $\vee$

$\equiv P$ Absorption law $\sim q \rightarrow q$

2.2

1) This loop will repeat exactly N Times if it doesn't contain a stop or a goto
If this loop doesn't contain a stop or goto, then it will repeat exactly N times

3) Freeze or I'll shoot
If you don't freeze, then I'll shoot

5) Truth tables $\sim p \vee q \rightarrow \sim q \rightarrow \vee$

P	q	~p	~q	~p ∨ q	
T	T	F	F	T	F
T	F	F	T	F	T
F	T	T	F	T	F
F	F	T	T	T	T

9) $P \wedge \sim R \leftrightarrow q \vee R$

P	q	R	~R	P∧~R	q∨R
T	T	T	F	F	T
T	T	F	T	T	T
T	F	T	F	F	T
T	F	F	T	T	F
F	T	T	F	F	T
F	T	F	T	F	T
F	F	T	F	F	T
F	F	F	T	F	F

16) If you paid full price, you didn't buy it at Crown Books.
$q \vee P$ you didn't buy it at Crown Books or you paid full price
P = you paid full Price
q = you didn't buy it at crown Books $\rightarrow P \rightarrow q$

P	q	$P \rightarrow q$	$q \vee P$
T	T	T	T
T	F	F	T
F	T	T	T
F	F	T	F

Not logically =

20) Negations
A) If P is sq then P is a rectangle
P is sq and P isn't a rectangle
d) If N is prime, then N is odd or n is 2
N is prime and both N isn't odd and isn't 2
f) If Tom is Ann's father, then Jim is uncle & Su is aunt
Tom's Ann's father and either Jim isn't her uncle or Su isn't her aunt

29) $P \to (q \vee R) \equiv (P \vee \sim q) \to R$

P	q	R	~q	q∨R	P∧~q	P→(q∨R)	P∧~q→R	∨
T	T	T	F	T	F	T	T	T
T	T	F	F	T	F	T	T	T
T	F	T	T	T	T	T	T	T
T	F	F	T	F	T	F	F	T
F	T	T	F	T	F	T	T	T
F	T	F	F	T	F	T	T	T
F	F	T	T	T	F	T	T	T
F	F	F	T	F	F	T	T	T

All truth values are T

40) Catching the 8:05 bus is sufficient condition for me being on time
If I catch the 8:05 bus, I will get to work on time

47) $P \wedge \sim q \to R$

$P \wedge \sim q \to R \equiv \sim(P \wedge \sim q) \vee R$

$\equiv \sim[\sim(\sim(P \wedge \sim q)) \wedge \sim R]$

2.3

6) $P \to q$
$q \to P$
$\therefore P \vee q$

P	q	P→q	q→P	P∨q
T	T	T	T	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	F

$\sim P \to q$ Invalid

22) If Tom isn't on team A, then Hua is on B $\sim p \to q$
If Hua isn't on B, then Tom is on A $\sim q \to p$
∴ Tom isn't on team A or Hua isn't on B. ∴ $\sim p \vee \sim q$

26) If I go to the movies, I won't finish homework.
P → Q valid transitivity
If I don't finish my homework, I won't do well on exam
Q → R
∴ If I go to movies, I won't do well on exam
∴ P → R

36) A) There is an undeclared variable or syntax error in first 5 lines

B) If there is a syntax error in first 5 lines, then there is a missing ; or variable misspelled

C) There isn't a missing ;

D) There isn't a misspelled variable name

41) 1) P → T ∴ ~P
2) ~P ∴ ~P ∨ Q
3) ~P ∨ Q → R ~P ∨ Q ∴ R
4) ~P R ∴ ~P ∧ R
5) ~P ∧ R → ~S ~P ∧ R ∴ ~S
6) S ∨ ~R ~S ∴ ~Q