EXERCISES FOR SECTION 3.8

PART I: TAUTOLOGIES

1. This statement is *not* a tautology.

A	$\vee$	B
F	F	F

2. This statement is *not* a tautology.

A	$\vee$	~	B
F	F	F	T

3. This statement *is* a tautology.

~	(A	&	~	A)	
F	T	T	F	T	×

4. This statement is *not* a tautology.

~	(A	$\vee$	~ A)
F	T	T	F T
F	F	T	T F

6. This statement *is* a tautology.

~	(~	(H	&	~ G)	&	G)	$\vee$	G	
T	F	T	T	T F	F	F	F	F	×
T	T	F	F	T F	F	F	F	F	×

7. This statement *is* a tautology.

(P	&	Q)	$\rightarrow$	Q	
	T	F	F	F	×

8. This statement *is* a tautology.

(X	$\rightarrow$	Y)	$\vee$	(Y	$\rightarrow$	X)	
F	F	T	F	T	F	F	×

9. This statement *is* a tautology.

~	(Q	$\rightarrow$	R)	$\rightarrow$	(~	Q	$\rightarrow$	R)	
T	F	T	F	F	T	F	F	F	×

10. This statement *is* a tautology.

((A	&	B)	∨	((~A	&	B)	∨	(A	&	~B)))	∨	(~A	&	~B)	
F	F	T	F	T F	F	T	F	F	F	F T	F	T F	F	F T	×
T	F	F	F	F T	F	F	T	T	T	T F	F	F T	F	T F	×
T	T	T	T	T		T		T		T	F	F T	F	F T	×

11. This statement *is* a tautology.

(P	→	Q)	∨	(P	→	~	Q)	
T	F	T	F	T	F	F	T	×

12. This statement is *not* a tautology.

~	(H	→	J)	→	~	(J	→	H)
T	T	F	F	F	F	F	T	T

14. This statement *is* a tautology.

[(G	&	~	H)	&	(H	&	~	G)]	∨	(P	→	P)	
				F					F	T	F	F	×

15. This statement *is* a tautology.

[~	W	&	(M	→	W)]	→	~	M	
T	F	T	T	F	F	F	F	T	×

16. This statement is *not* a tautology.

~	(Q	&	E)	→	~	(Q	∨	E)
T	F	F	T	F	F	F	T	T

17. This statement *is* a tautology.

(H	→	J)	→	((H	→	~	J)	→	~	H)	
T	T	F	F	T	T	T	F	F	F	T	×

18. This statement *is* a tautology.

[J	→	(H	&	K)]	→	[(J	→	H)	&	(J	→	K)]	
T	T			F	F	T	T		F	T	F	F	×
T	T	F	F		F	T	F	F	F	T	T		×
F	T				F	F	T		T	F	T		×

19. This statement is *not* a tautology.

[~	A	&	(~	B	&	~	C)]	∨	(A	&	B)
F	T	F	T	F	F	F	T	F	T	F	F
								F	F	F	T
								F	F	F	F

20. This statement *is* a tautology.

[(X	&	Y)	→	Z]	→	[(X	→	Z)	∨	(Y	→	Z)]	
T	T	T	T	F	F	T	F	F	F	T	F	F	×

PART II: VALIDITY

21. This argument is *valid*.

A	&	B		A	
F	T			F	×

22. This argument is *in*valid.

A	∨	B		~A	∨	~B
T	T	T		F T	F	F T

24. This argument is *in*valid.

~	(P	&	Q)		~P	&	~Q
T	T	F	F		F T	F	T F
T	F	F	T		T F	F	F T

25. This argument is *valid*.

~	H		~	J		~	(H	&	J)	
T	T		T	T		F	T	T	T	×

26. This argument is *valid*.

Z	∨	W		W	→	Z		Z	
F	T	T		T	T	F		F	×

27. This argument is *in*valid.

C	∨	~	D		D	→	C
F	T	F	T		T	F	F

28. This argument is *in*valid.

E	∨	F		~	~	E		F
T	T	F		T	F	T		F

29. This argument is *valid*.

~	G	→	H		~	H		G	
T	F	T	F		T	F		F	×

30. This argument is *valid*.

~	(A	→	B)		~	B	
T	T	F	T		F	T	×
T	F	F	T		F	T	×

32. This argument is *in*valid.

F	→	G		~ F	→	~ G		~	(F	&	G)
T	T	T		F T	T	F T		F	T	T	T

33. This argument is *valid*.

(J	&	K)		~	K	∨	J		~	K	∨	J	
F	T	T		F	T	T	F		F	T	F	F	×

34. This argument is *valid*.

H	→	J		~	J	→	(H	→	J)	
T	T	F		T	F	F	T	F	F	×

35. This argument is *in*valid.

~	(K	&	~	L)		~	K		L
T	F	F	T	F		T	F		F

36. This argument is *valid*.

~	(~	~	K	&	~	~	L)		~	~	K		~	L	
T	T	F	T	T	T	F	T		T	F	T		F	T	×

37. This argument is *valid*.

J	→	K		~	(K	∨	L)		~	J	
T	T	T		T	T	T			F	T	×

38. This argument is *in*valid.

M	→	N		N	→	O		~	M		~	O
F	T	T		T	T	T		T	F		F	T
F	T	F		F	T	T		T	F		F	T

39. This argument is *in*valid.

~	P	∨	Q		~	Q	∨	R		~	R		P
T	F	T	F		T	F	T	F		T	F		F

40. This argument is *valid*.

~	A		(C	∨	D)	→	~	A		A	→	~	D	
T	F					T				T	F	F	T	×

42. This argument is *in*valid.

H	→	J		J	→	~	(L	&	M)		~	M		H	&	J
F	T	T		T	T	T	T	F	F		T	F		F	F	T
F	T	T		T	T	T	F	F	F		T	F		F	F	T
F	T	F		F	T	T	T	F	F		T	F		F	F	F
F	T	F		F	T	T	F	F	F		T	F		F	F	F

43. This argument is *valid*.

H	&	(G	∨	F)		~	(G	→	F)		~	H	→	G	
F	T	F				T	F				T	F	F	F	×

44. This argument is *valid*.

~	[K	∨	(K	→	M)]		P	&	~	P	
T	F	F	T	F			T	F	F	T	×
T	F	F	T	F			F	F	T	F	×
							F	F	F	T	×

45. This argument is *in*valid.

~	(S	&	~	L)		(L	&	S)	∨	(~	L	&	~	S)
T	F	F	F	T		T	F	F	F	F	T	F	T	F

46. This argument is *valid*.

R	∨	(S	→	T)		~	T	&	~	R		~	(S	&	U)	
F	T	T	F	F		T	F	T	T	F		F	T	T	T	×

47. This argument is *in*valid.

~	[H	→	(K	→	M)]		K	&	~	M		H	→	(K	→	M)
T	T	F	T	F	F		T	T	T	F		T	F	T	F	F

48. This argument is *valid*.

~	[M	∨	(N	∨	O)]		(~	M	→	P)	&	(~	O	→	P)		P	→	~	N		~	N	→	P	
T	F	F	F	F	F		T	F	F	F	T	T	F	F	F		F	T	T	F		T	F	F	F	×

49. This argument is *valid*.

(E	∨	G)	→	F		(G	∨	H)	→	F		(G	&	E)	∨	(G	&	H)		F	&	G	
		F	T	T		F			T	T		F	F		T	F	F			T	F	F	×
		T	T	F		T	T		T	F		T			T	T				F	F	T	×
			T						T			F	F		T	F	F			F	F	T	×

50. This argument is *valid*.

(A	&	B)	→	(C	→	(D	&	E))		~	(D	→	E)	&	C		~	(A	&	B)	
T	T	T	T	T	F	T	F	F		T	T	F	F	T	T		F	T	T	T	×