Phil 201: Critical Thinking
Practice Assignment #5
Truth Tables

Construct truth tables to determine if the following arguments are valid or invalid.

1. $G \rightarrow H$
   $\underline{H \ \& \sim G}$
   $\sim(H \vee G)$

2. $\sim A \rightarrow (C \ \& \ B)$
   $\underline{B \ \vee \ \sim C}$
   $(A \vee C) \ \rightarrow B$

3. $(J \ \& \sim L) \rightarrow K$
   $\underline{\sim(J \rightarrow L)}$
   $K \ \& \sim L$

4. $\sim(G \vee (E \rightarrow D))$
   $\sim H \rightarrow E$
   $\underline{D \ \& \ H}$
   $E \vee G$

5. $\sim(U \ \& \ V) \rightarrow (W \rightarrow \ X)$
   $\underline{\sim X \ \& \ V}$
   $\sim V \vee (U \rightarrow W)$

Answers

1.

G, H. Two letters, need 2 x 2 = 4 lines in the truth table.

Be sure to put letters in alphabetic order. Then have a column for each premise. The conclusion should be in the last column. You are looking for a line where the premises are all true and the conclusion is false.

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

INVALID by line 3.

2.

A, B, C. Three letters, need 2 x 2 x 2 = 8 lines in the truth table.

A	B	C	~A → (C & B)	B ∨ ~C	(A ∨ C) → B
T	T	T	T	T	T
T	T	F	T	T	T
T	F	T	T	F	F
T	F	F	T	T	F
F	T	T	T	T	T
F	T	F	F	T	T
F	F	T	F	F	F
F	F	F	F	T	T

INVALID by line 4.

3.

J, K, L. Three letters, need 2 x 2 x 2 = 8 lines in the truth table.

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

There are no lines in this true table where the premises are all true and the conclusion is false. The argument is VALID.

4.

D, E, G, H. Four letters, need 2 x 2 x 2 x 2 = 16 lines in our truth table.

D	E	G	H	~(G ∨ (E → D))	~H → E	D & H	E ∨ G
T	T	T	T	F	T	T	T
T	T	T	F	F	T	F	T
T	T	F	T	F	T	T	T
T	T	F	F	F	T	F	T
T	F	T	T	F	T	T	T
T	F	T	F	F	F	F	T
T	F	F	T	F	T	T	F
T	F	F	F	F	F	F	F
F	T	T	T	F	T	F	T
F	T	T	F	F	T	F	T
F	T	F	T	T	T	F	T
F	T	F	F	T	T	F	T
F	F	T	T	F	T	F	T
F	F	T	F	F	F	F	T
F	F	F	T	F	T	F	F
F	F	F	F	F	F	F	F

There are no rows will all true premises and a false conclusion so the argument is VALID.

5.

U, V, W, X. Four letters, need 2 x 2 x 2 x 2 = 16 lines for the truth table.

U	V	W	X	~(U & V) → (W → X)	~X & V	~V ∨ (U → W)
T	T	T	T	T	F	T
T	T	T	F	T	T	T
T	T	F	T	T	F	F
T	T	F	F	T	T	F
T	F	T	T	T	F	T
T	F	T	F	F	F	T
T	F	F	T	T	F	T
T	F	F	F	T	F	T
F	T	T	T	T	F	T
F	T	T	F	F	T	T
F	T	F	T	T	F	T
F	T	F	F	T	T	T
F	F	T	T	T	F	T
F	F	T	F	F	F	T
F	F	F	T	T	F	T
F	F	F	F	T	F	T

INVALID by line 4.

For a partial truth table, complete one column entirely (doesn't matter which one) and continue on with only the rows that have some chance of being invalid (i.e. true premises and a false conclusion).

Here is an example (question 5).

U	V	W	X	~(U & V) → (W → X)	~X & V	~V ∨ (U → W)
T	T	T	T			T
T	T	T	F			T
T	T	F	T		F	F
T	T	F	F	T	T	F
T	F	T	T			T
T	F	T	F			T
T	F	F	T			T
T	F	F	F			T
F	T	T	T			T
F	T	T	F			T
F	T	F	T			T
F	T	F	F			T
F	F	T	T			T
F	F	T	F			T
F	F	F	T			T
F	F	F	F			T

INVALID by line 4.