If a divides b or a divides c then a divides bc,

~~If~~ does

If A does not divide BC then A does not divide B and A ~~and~~ does not divide C.

$P = T \quad Q = T \quad U = F \quad V = F \quad W = T \text{ or } F$

1 $(P \vee Q) \vee (U \wedge W) = (T \vee T) \vee (F \wedge T)$ W is true

or

$(T \vee T) \vee (F \wedge F)$ W is false

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

$T \vee F = T$

The statement is ~~call~~ a tautology.

2 $(U \wedge \neg V) \Rightarrow (P \wedge W)$

$(F \wedge \neg F) \Rightarrow (T \wedge T)$ if W is true

$(F \wedge T) \Rightarrow T$

$F \Rightarrow T$

$T$

the statement is true when W is true.

$(U \wedge \neg V) \Rightarrow (P \wedge W)$

$(F \wedge \neg F) \Rightarrow (T \wedge F)$ if W is false

$(F \wedge T) \Rightarrow F$

$F \Rightarrow F$

$T$

the statement is also true when W is false.

The statement is a tautology. W is a "don't care" term.

3 $W \Rightarrow (P \wedge U)$

$W \Rightarrow (T \wedge F)$

$W \Rightarrow F$

If ~~F~~ W is false the statement is true.

If W is true true implies false is false, so we don't know if ~~the~~ statement #3 is true or false.

4 $P \wedge (W \Rightarrow Q)$

$T \wedge (W \Rightarrow T)$

~~This~~ If W is True

$T \wedge (T \Rightarrow T)$

$T \wedge T$

$T$

If ~~W~~ W is false

$T \wedge (F \Rightarrow T)$

This is a vaccuous truth.

Therefore statement #4 is a tautology.

$(P \vee R) \wedge (\neg Q \vee R) \equiv (P\cancel{Q} \Rightarrow Q) \Rightarrow R$

$(R \vee P) \wedge (R \vee \neg Q) \equiv (P \Rightarrow Q) \Rightarrow R$ Commutative property of $\vee$

$R \vee (P \wedge \neg Q) \equiv (P \Rightarrow Q) \Rightarrow R$ Distributive property

$(P \wedge \neg Q) \vee R \equiv (P \Rightarrow Q) \Rightarrow R$ Commutative property of $\vee$

$\neg(\neg(P \wedge \neg Q)) \vee R \equiv (P \Rightarrow Q) \Rightarrow R$ Double Negation Property

$\neg(P \wedge \neg Q) \Rightarrow R \equiv (P \Rightarrow Q) \Rightarrow R$

$\neg(\neg(P \Rightarrow Q)) \Rightarrow R \equiv (P \Rightarrow Q) \Rightarrow R$

$(P \Rightarrow Q) \Rightarrow R \equiv (P \Rightarrow Q) \Rightarrow R$