Most common	+ Jamous Logical	l Equivaler
		The Month
Name of the law	Primal form	Dual form
1 Identity law	PVF = P	PMTEP
2. Domination " (Null Law)	PVTET	
3. Idempotent ", cself Repeat)	PVPEP	PAPEF.
4. Double Negation " (Dovolution law)	7(7P) = P.	
5. Commutative law	PV9 Z 9VP	PAQ = 91P.
6. Associative law	(PV9) VY = PV(qVY)	(PAQ) AY = PALGAY)
7. Dishi butive law	PV(qnr) =(PVq) ^(PVr)	Pr(qvr) = (prq)v(prr)
8. De morgou's law	7(PV2)=7P179	7 (PA9) = 7PV79
9. Absorption law	PVCPAQ) = P.	PA(PVQ) EP.
O. Negation law	PVTPZET	PATP 3F.
(complement law)	Ta	king Par common
PV (PAQ) = (PVP) \ (PVQ) = PN(PVQ) - PVP=P = PA 1 - 1VQ = 1		
= (PAP) VP	12) - Disho	P -: P1=P
E PV(PAG	7) 9	

Equivalence involving conditionals? INTP->2 = 7PV2 2 X P->9 = 179->7p -> contrapositive 3. PV9 = 7P->9 4. PAQ = 7(P>79) 5. 7(P-)9) = P179 (P69) $\frac{1}{6} \left(P \rightarrow 9 \right) \wedge \left(P \rightarrow \gamma \right) = P \rightarrow \left(9 \wedge \gamma \right)$ 7. (P>r) 1 (q>r) = (Pvq) ->r. 8. (P->9) V (P->7) = P-> (9V7) (x) q $(p \rightarrow r)$ $V(q \rightarrow r) = (p \land q) \rightarrow r$ Equivalence Involving Bi-Conditionals: P (-> 9 = 7P (-> 79 2. 7 (p=>2) =

Implications :- ABB is tour 6.7(P→9) → P. 7.7(P→9) → 79 8. PA(P>q) => 2 9.79 1 (P)9) => 7P. 10. 7PA(PV9) => 9 11. $(P\rightarrow q) \land (q\rightarrow r) \Rightarrow P\rightarrow 8$ 12. (PV9) 1 (P->x) 1 (9->x)

= (PAR) V (PAR)

Posblems ?-1 Without using touth tables poore the Following (or) using the laws of logic PT (Prg) -> Prg is a tauto logy Property (E) T. (PAQ) -> PVQ = TCP(AQ) V (PVQ) -> logical Equivalence
P>QZ TPVQ = (TPV79) V (PV9) - DeMorgon's law TCPA9) = TPV79 = TPV(T9V(PV9)) - Associative (PV9) VY = PV(qvr) 3 TPV (GQVP) VQ) - " PV(qvr) 2(pvq) vr = TP V ((PV79) V9) - commutative law (PV9) = (9VP) = TPV (PV(79V9) - Associative = 7PV(PVT) - complement law
TPVP3T = 7PVT - Dominant PVT = T or P = (TGB) V9= null(90000

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(2) using Laws of logic, Prove the
    (TPV2) n (PN(PN2)) = PN2
   (TPV9) 1 (P1(P19) = (TPV9) ((P1P)19) - am
(7PV9) NP] 19
                = (TPV9) 1 (PA9) -> idempotent
(7PAP) V (9AP) A9
               = (PAQ) ^ (TPVQ) - commutative
TF V (91P) 19
               = ((PAQ) ATP) V ((PAQ) AQ) - Dishibute
  (9×8) 12
              = ((QAP) ATP) V (PA(QAQ) - commutative
  (PAQ) 22
              = (91(P17P)) V (P19) - amountire complement
  Pr(gray)
              = (91F) V(P19) - complement
   PAN
              = FV(PAQ) - Null or Dominant
              = PAQ - Identity
3 using Laws of logics, Show that
     P-)(2-)P) = 7P->(P->2)
     P > (9 > P) = TPV (9 > P) Logical Equivalence
                = 7p V (79 V P) " P > 9 = 7PV9
                = 7PV(PV79) commutative
                                associative
               = (TPVP) V79
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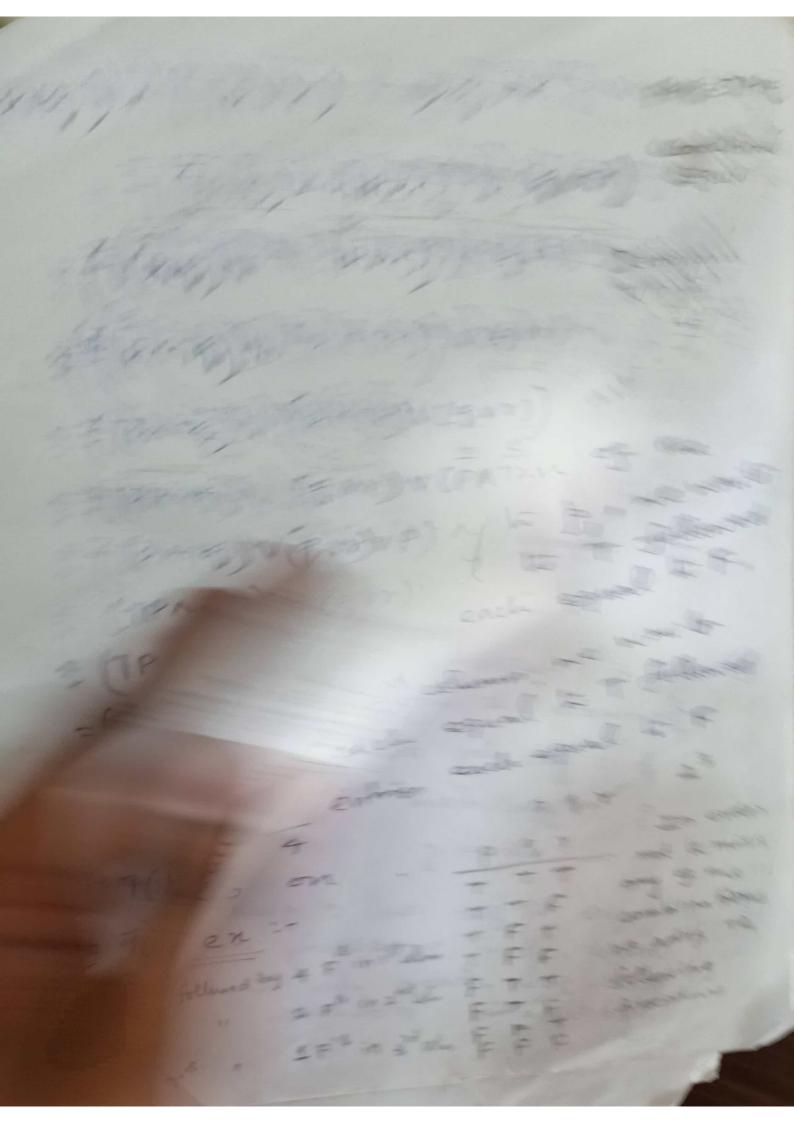
ELAL Samement Wallet >(5->16) = 2(12) (11-12) WHILLIA = P7 (P->3) - And man (m) They will grant grant - continued abung abung = (PV78) vg - anonyala Anamakan - 3VI ET - complement rom O a 3 it follows that R. Hs = L. H. S. as all tautologies are equivalent to one another All Contradictions are equivalent to one another, Determine which of the following shalament are tantologies or contradictions without using bouth tables (i) (P -> 7P) -> 7P.

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(P->7P) ->7P = (7PV7P)->7P
                      = 7P ->7P P>757
       = 7(7P) V7P
      E PV7P Double negation
     It is a tautology = ( Complement.
(2) P-> (Pvq)
    P-> (Pvq) = 7PV(Pvq) conditional Equins
          = (TPVP) VQ Associative
       ETV9 complement
E(T) Dominant (00) Null
(3) (9 \rightarrow P) \wedge (7P \wedge 9)

(9 \rightarrow P) \wedge (7P \wedge 9) = (19 \vee P) \wedge (7P \wedge 9)
      =((19VP) 17P) 19 associative
            = (TPA(79VP)) 12 commutative
        = (TPATQ) V (TPAP) 1 AQ Dishibutive
  contradiction = [(TPATQ) V F] AQ complemen or Negation = (TPATQ) AQ city Liver Negation
           = (TPAT2) AQ identity

= TPA(TQAQ) complements

= TPA F = F. Coull.
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Example 1- prove the following implications

(1) without using touth bulles. (i) $p \wedge q \Rightarrow p \rightarrow q$ To prove $p \wedge q \rightarrow (p \rightarrow q) \equiv T$. $p \wedge q \rightarrow (p \rightarrow q) \equiv 7(p \wedge q) \vee (7p \vee q) \quad a \rightarrow b \equiv 7a \vee b$ $\equiv (7p \vee 7q) \vee (7p \vee q) \quad coe Morganis \rightarrow$ (commutative laws) = (79 N 7P) V (7PV.9) (associative laws) =[(79 V7P) V7P] V2 = [79 V (7PV7P)] V9 (")

= [79 V (7PV7P)] V9 (") (idempotent-law) = (79 V 7P) V9 (commutative law) = 70 V (79 V 9 (7p V 79) V 9 cassociative law) = 7PV (79 v 9) (complement law) 3 TP V TOVI (null law) 3 T V (TYP V (TYP) T)

P => C9->P) To prove P-> (2->P) = T P -> (9->P) = 7P V (79 VP) a>b 37a Vb = 7PV (PV79) (commutative law) = (TPVP) V79 (associative law) = 7 V 79 (complement laur) = T (null law) (3) ((pv7P) ->9) ->(pv7P)->r)=>9->r. To prove $((pv7p)^{\frac{1}{2}} \rightarrow 2) \rightarrow ((pv7p) \rightarrow r) \rightarrow (2\rightarrow r)$ $((pv7p)^{\frac{1}{2}} \rightarrow 2) \rightarrow ((pv7p) \rightarrow r) \rightarrow (2\rightarrow r)$ $= (7\rightarrow 2) \rightarrow (7\rightarrow r) \rightarrow (2\rightarrow r)$ = (7TV2) -> (77VY)] -> (79VY) $= \frac{\left((F \vee 2) \rightarrow (F \vee r)\right)}{\left((G \rightarrow r) \rightarrow (G \rightarrow r)\right)} \rightarrow \frac{\left((G \rightarrow r) \vee (G \rightarrow r)\right)}{\left((G \rightarrow r) \rightarrow (G \rightarrow r)\right)} \rightarrow \frac{\left((G \rightarrow r) \vee (G \rightarrow r)\right)}{\left((G \rightarrow r) \rightarrow (G \rightarrow r)\right)} \rightarrow \frac{\left((G \rightarrow r) \vee (G \rightarrow r)\right)}{\left((G \rightarrow r) \vee (G \rightarrow r)\right)} \rightarrow \frac{\left((G \rightarrow r) \vee (G \rightarrow r)\right)}{\left((G \rightarrow r) \vee (G \rightarrow r)\right)} \rightarrow \frac{\left((G 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Nota, following equivalence and prove tack duals without using bouth tack (i) 7(PAQ) -> (7PV (7PVQ)) = 7PVZ L-43 7 (7(PAQ) V(7PV(7PVQ)) Dual i (PV9) 1 (TPXCTP12) = TP12 L.B (prg) A (TPACTPAQ) = (prg) N(TPXTP) N(TPVgg)] Dishibutive (AVB) AC, = (pv2) 1 (1P12) = (9 vp) ~ (7 p ng) = (9×10×70) (2×(70~2)) V (p170) = (217P) V(FAQ) = (217P) VF Cidentity laws = 2071. PVF 3 P. Note: - If a Statement formula contains > or <-> , we suplace them by equivalent formula involving , and V and then Write the dual.