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### **DEPARTMENT OF MATHEMATICS**

1. Show that (Jx) M(x) follows loggeally (x) [HIX) - M(x), (FX) H(x) Rule premases Step P (20) [H(20) -> m(20)] 1. US  $H(y) \rightarrow M(y)$ 514 2. P (Fx) H(x) 3. H(Y) ES 233 4. + P.P+R >Q M(4) 52,43 B. EGI 6. (FOUMORS 2. All burnats are mortal. Sachen is a human Therefore he is mostal. H(20): 20 98 a human M(21): 21 "B Mostal H(6): Sachen & a human The premeses ane. (+x) [H(x) -> M(x)], H(5) condussion: M(5) Step Premises Prile (Yac) [HIX) -> MIDO] 1 -H(S) -> M(S) P 714 2 HIS) T P.P.>Q 3. M(S) §2,3]4. 3. Show that the premises, "one student in this class knows how to write programs 9n JAVA "a "Everyone who knows how to weste program 90 JAVA can get a high-paying Job " amply the Condusion "some one on this class can get a hagh - paying dets .





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A(x): x 43 90 this clouge J(21): & Knows how to welte program Pn JAVA Let H(x): 2 can get a high paying for . plemises are, The  $(\exists x) (A(x) \land J(x)), (\forall x) (\exists x) \rightarrow H(x))$ Consclusion: Fr (A(21) AH(21)) Rule piemisos Step P (1x)(A(x)A)(xE) 1. ES E13 2. A(Y) A J(Y) A(Y)AJ(Y) =) A(Y) T fay 3. A(y)  $A(y) \wedge J(y) \Rightarrow J(y)$ T 5234. J(Y) P 5. (42) (J(21)-7 H(21)) US JIY) > HIY) 754 6. 7. H(Y)A(y), H(y)=) A(y) H(y) {z, TY 8. A (Y) A HIY) (J2) (A(30) (H(30)) EGIN 9. 4]. Verify the validity of the following argument. "Every Aving thring is a plant or an animal" "John's gold facto is also and it is not a plant" "All answals have hearts". Therefore, " John's first was a beart". gold L(x1): 21 33 a 1949109 thang L(j): j93 allive P() : j is not a  $P(\alpha): \alpha \beta \alpha plant P(j): j e$   $A(\alpha): \alpha \beta \alpha nimal$   $H(\gamma): \alpha \beta \alpha heart H(j): j e$ plant  $G_{VD}: (+x) [L(x) \rightarrow P(x) \vee A(x)]$ LG>ATPG), (+2) [AGA) -> HIZO]





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(on dusion: H()) Step Prennes Rule  $(\forall \Rightarrow) [L(\pi) \rightarrow P(\pi) \lor A(\pi)]$ P 1. US L(j) -> p(j) VA(j) 2. 514 P L(j)n TP(j) 3. PAQ >> P T 5334. 2(j) P. P->Q >Q T 寂,435. PGOV AGO PARE 7 PVQ TP(j) -> A(j) T 553 6. (47c) [AIR + H(7)] P 7.  $A(j) \rightarrow H(j)$ 5838.  $7 P(3) \rightarrow H(3)$ PAQ=> P,Q 9. T P, P>Q >Q 7 P(j) \$33 10. H(J) 11. mussic", "some "All locic maggic is load " some loud music locic music expet " Therefore 51. R(x) : x B a Lour must exest" L(x) : x is a loud music (+>0 [R(>)→ L(>)], (J>0 R(>) Girn. Conclussion: (Fx) L(x)  $(\forall x)$   $(R(x) \rightarrow L(x))$ 115 1. R(Y) - L(Y) (r) Problem Prove 513 2. (Fr) R(x) ES 3. R(Y) 533 4. T L(Y) 52,43 5. EG (Jx) L(x) 6





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agament.
6] Establish the validety of argument.
1). All sprtagers are equit
ii) some antogers are pour humbers are
11 i). Therefore some lutur
Power of all
I (x): x is an integer
Rise): 21 is an eathonal number
Prov : a 92 power of 3. (-(m) AP(00)
$P(x): x \neq power of z$ $P(x): (I(x) \rightarrow R(x)), (Jx) (I(x) \land P(x))$
condusion: (Fx) [R(x) ^ P(x)]
Stop premises Rule
P
$\exists 1] a.$ $T(y) \rightarrow R(y)$ $OS$
3 (FX) [IN A PION] P
E3J4. I(Y) A P(Y) ES
$\overline{z_{43}}$ 5. $T(4)$ $T$ $PAQ \Rightarrow PEQ$
72,576. $R(9)$ $T$ $P, P > a = 7$
T PAR SR
$T P. Q \Rightarrow PAQ$
$R(9) \wedge P(9)$
9. (Fruit Riber A Proc) EG

J. Show that (x) [ P(x) V Q(x)] ⇒ (x) P(x) V(F)) and by Proderect Proof. Premases: (x) [ P(x) V Q(x)] Condusion: (x) P(x) V (Fx) Q(x)





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	5 10
Stop peomacas	Rule P
1. (a) [P(2) v Q(2)]	US
513 2. Pry) v Q(y)	Nogation of
3. 7[(x) P(x) V (7x) Q(x)]	conclusion
532 A. (Ja)TP(2) A (2)TQ(2)	T T(PAQ) AT TPYTQ
{33 4. (J=20)7P(20) / (=1)	TPAQSP
(725) (72)P(2)	ES
74) ~ 7 P(4)	T PARAR
259 0. (20) TR12()	, US
	PO=>POQ
1 , 78(4)	- P. TO ET T(PVE
1) 6,839- TP(9) ATQ(9)	
[1] 10. 7(P(y) V Q(Y))	$T$ $P, Q \Rightarrow P \land Q$
(1) (1) [P(4) V Q (4)] ~ T[P(4) V Q(4)]	T PATP F
{113 12. F	
	Sing Proplecation
8]. USPING OP sule, OFTALD > TAIX	)] => Rept TP(2)]
(Ha)EP(20-> allos,	(M Ende
D. c. off SOS	Rate
E	₽ P
1. $(\forall \pi) [P(\pi) \rightarrow Q(\pi)]$ 2. $(\forall \pi) [R(\pi) \rightarrow TQ(\pi)]$ 2. $(\forall \pi) [R(\pi) \rightarrow TQ(\pi)]$	
	plassimed)
0(4)	P P P = A
4, $TO(y)$	T F, FJar
(3,4)5	US DID TO J7P
1 · j · S	T $P \rightarrow Q, 7Q \rightarrow 7P$
\$5,63 7.	





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[4,73] 8.  $R(y) \rightarrow \tau P(y)$  CP [83] 9.  $(+\infty) [R(\infty) \rightarrow \tau P(\infty)]$  UG