Rajat Jaiswal 2017CS50415

TC1

$\forall x [F(x) \to g(x)]$ $\quad \forall x F(x)$

$\sim g(a)$

$\sim g(a)$

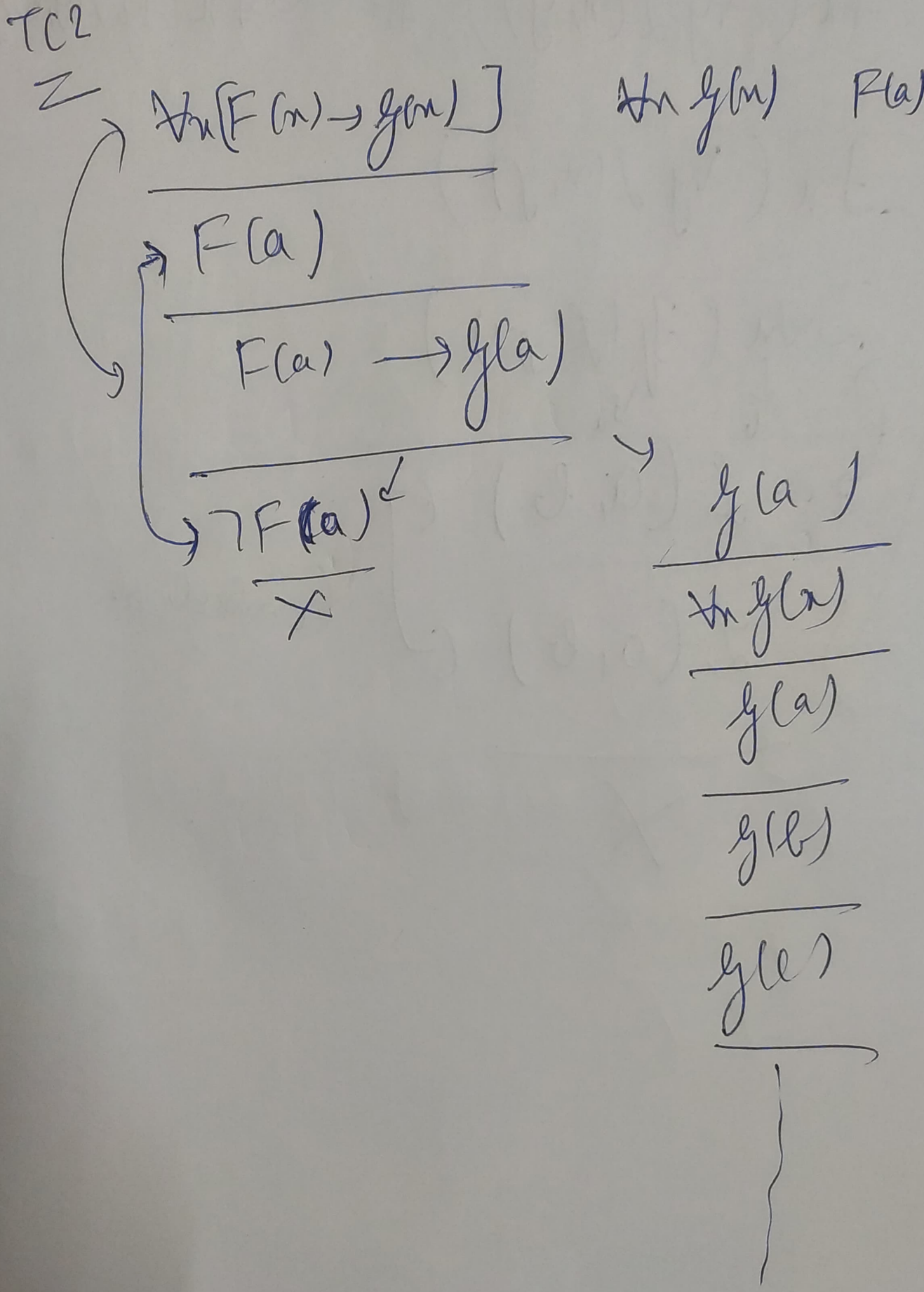
$F(a) \to g(a)$

$\sim F(a)$ $\quad g(a)$

$\forall x [F(x)]$

$F(a)$

$\times$ $\quad \times$


TC2
∀x[F(x) → g(x)]
∀x g(x)
F(a)
F(a)
F(a) → g(a)
¬F(a)
X
g(a)
∀x g(x)
g(a)
g(b)
g(c)

TC3

$\forall x[F(x) \rightarrow G(x)]$ $\exists x(F(x) \wedge H(x))$

$\sim \exists x(F(x) \wedge H(x))$

$\exists x(F(x) \wedge H(x))$

$F(a)$

$H(a)$

$\neg \exists x(F(x) \wedge H(x))$

$\neg(F(a) \wedge H(a))$

$\neg F(a)$

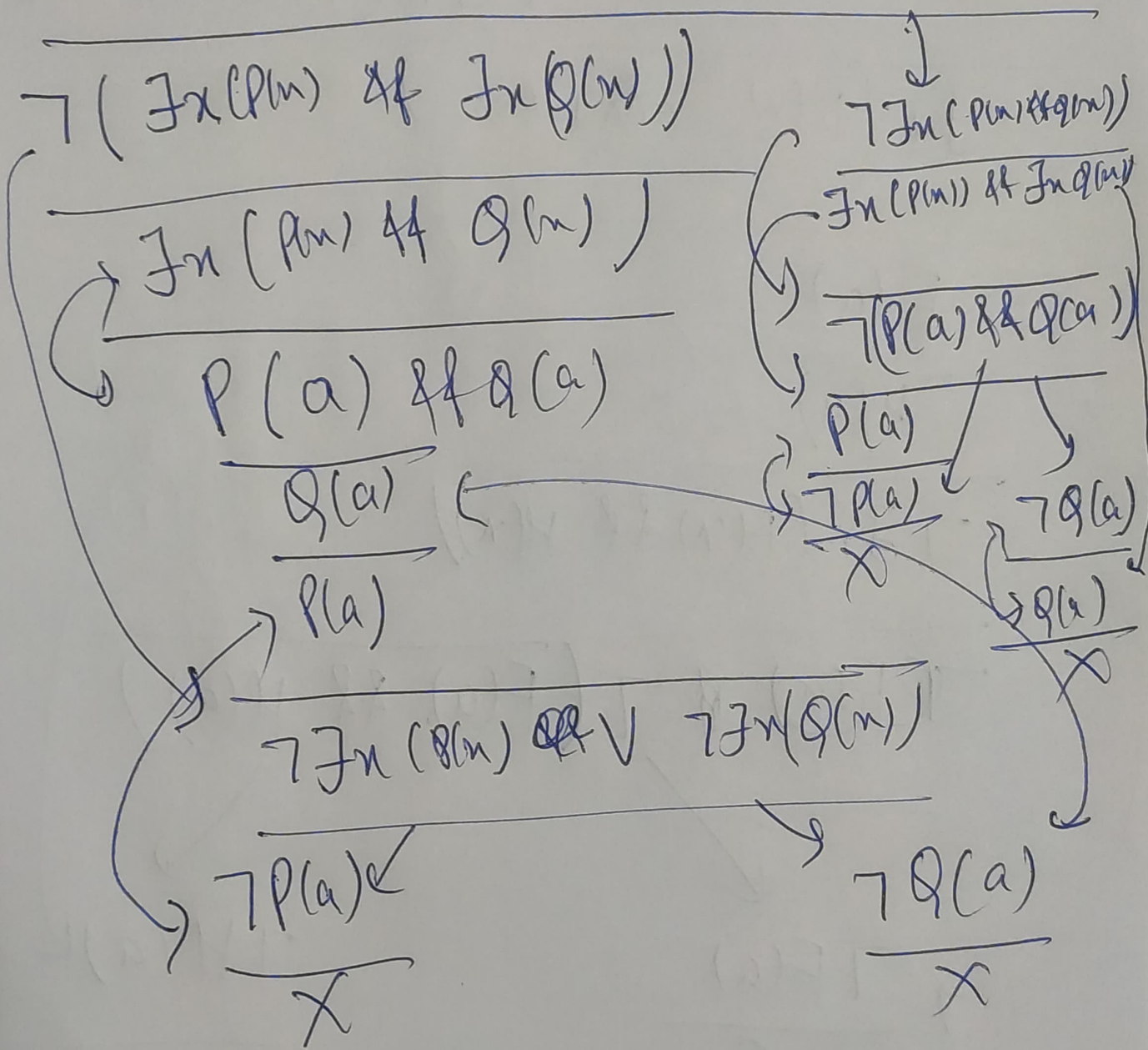
$\times$

$\neg H(a)$

$\times$

TC4

$$\neg\left(\exists x(P(x) \wedge Q(x)) \Leftrightarrow (\exists x P(x) \wedge \exists x Q(x))\right)$$



TC6

$\exists x(\forall y\, L(x,y)) \;\not\vdash\; \sim\forall x(\exists y\, L(y,x))$

$\exists x(\forall y\, L(x,y))$

$\sim\forall x(\exists y(L(y,x)))$

$\downarrow b \qquad \downarrow a$

$\sim L(a,b)$

$L(a,b)$

Contradiction

$\times$

TC7

P1 ≡ P1 $\forall x \left(P(x) \rightarrow \exists y \left(P(y) \wedge q(y,x) \right) \right)$

P2 $\forall x \left(P(x) \rightarrow r(x,a) \right)$

P2 ≡ $P(x) \rightarrow (P(y) \rightarrow (r(y,x) \rightarrow \sim q(x,y)))$

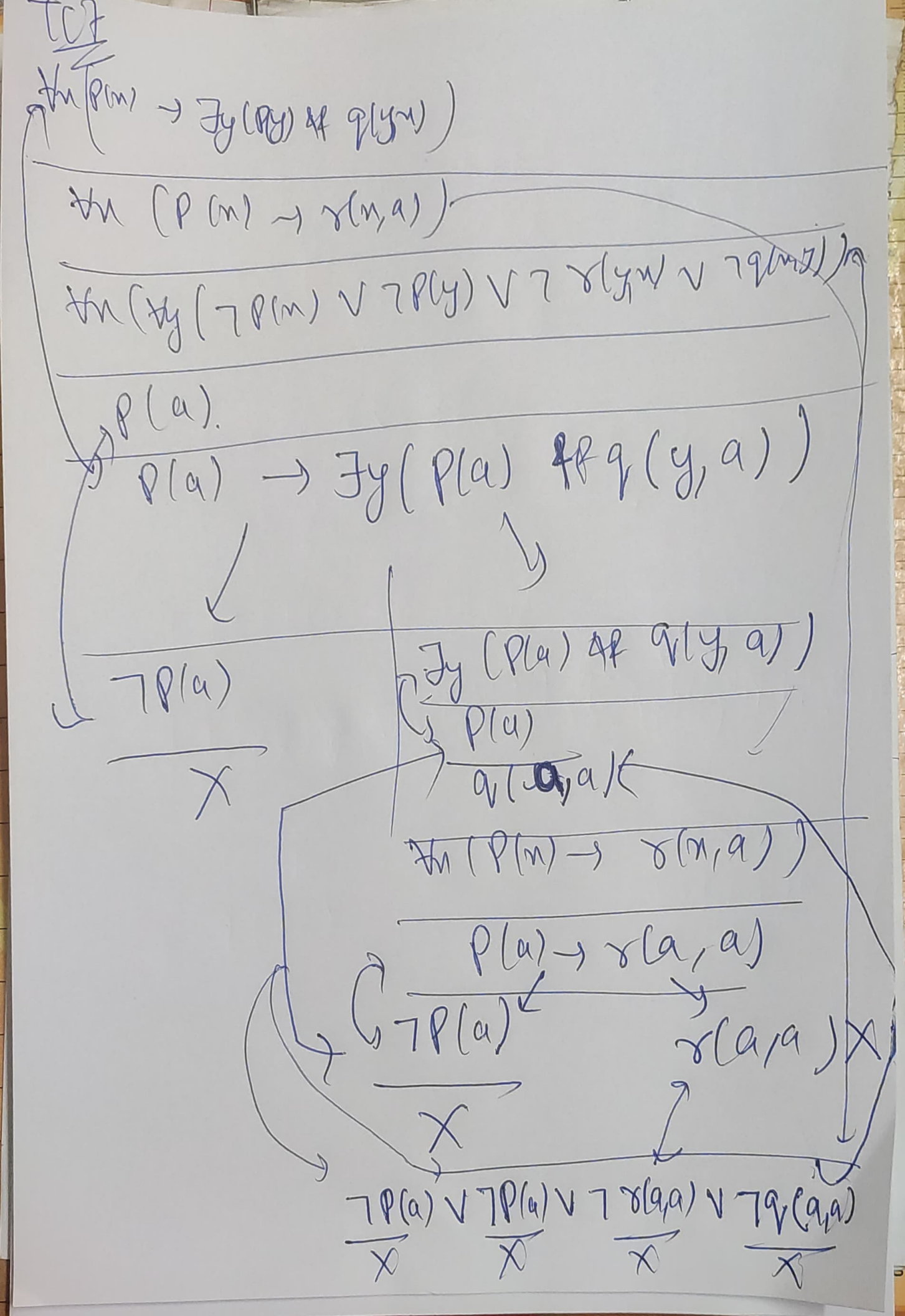
P3 ≡ o) $\forall x \left(\forall y \left(P x \quad \right) \right)$

P4 $\neg P(x) \vee \neg P(y) \vee \neg r(y,x) \vee \neg q(x,y)$

≡

P3 $\forall x \forall y \left(\neg P(x) \vee \neg P(y) \vee \neg r(y,x) \vee \neg q(x,y) \right)$

Query $P1 \wedge P2 \wedge P(3) \wedge P(a)$.


∀x(P(x) → ∃y(Q(y) ∧ q(y,x)))
∀x (P(x) → r(x,a))
∀x(∃y(¬P(x) ∨ ¬P(y) ∨ ¬ r(y,x) ∨ ¬q(x,z)))
P(a).
P(a) → ∃y(P(a) ∧ q(y,a))
¬P(a)
X
∃y (P(a) ∧ q(y,a))
P(a)
q(a,a)
∀x (P(x) → r(x,a))
P(a) → r(a,a)
¬P(a)
X
r(a,a) X
¬P(a) ∨ ¬P(a) ∨ ¬ r(a,a) ∨ ¬q(a,a)
X X X X