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3/12/24.

First order logic: Forward chaining.

Slove using forward chaining.

Problem: As per the law, it is a crime for an American to sell weapons to hostile nations. Country A, an enemy of America, has some missiles, and all the missiles were sold to it by Robert, who is an American citizen.

Prove that "Robert is criminal"

Facts:

Missile(m_1).
Owns(A, m_1)
Enemy(A, America)
$\forall x$ (Missile(x) $\Rightarrow$ Weapon(x)).
American(Robert)
Sells(Robert, m_1, A).

Rule:

Hostility Rule: $\forall x \forall y$ (Enemy(x, y) $\Rightarrow$ Hostile(x)).
Crime Rule:
$\forall x \forall y \forall z$ (American(x) $\wedge$ Sells(x, y, z) $\wedge$ Weapon(y) $\wedge$ Hostile(z) $\Rightarrow$ Criminal(x)).

- Apply the rule $\forall x$(Missile(x) $\Rightarrow$ Weapon(x)):
  - Missile(m_1) $\Rightarrow$ Weapon(m_1).
  - $\therefore$ Weapon(m_1).

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- Apply the rule $\forall x \forall y (Enemy(x,y) \Rightarrow Hostile(x))$:
  $Enemy(A, America) \Rightarrow Hostile(A)$.
  $\therefore Hostile(A)$.

- Rule $\forall x \forall y \forall z (American(x) \wedge Sells(x,y,z) \wedge weapon(y) \wedge Hostile(z) \Rightarrow Criminal(x))$.
  - $American(Robert)$
  - $Sells(Robert, M1, A)$.
  - $weapon(M1)$
  - $Hostile(A)$.

All conditions are satisfied.
$Criminal(Robert)$.