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Homework #3
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Problem #1
== Conversion into FOL
A. ∀s: ¬G(s,Blues) ∨ ¬G(s,Opera)
B. ∀s W(Amy,s) => S(Amy,s)
C. ∃s W(Amy,s) ∧ G(s,Blues)
D. ∀s[∃p[F(p,Joe) ∧ S(p,s)] => L(Joe,s)]
E. F(Amy,Joe)
F. ∃s: L(Joe,s) ∧ ¬G(s,Opera)
G. ∀s[L(Joe,s) => ∃p[F(p,Joe) ∧ S(s,p)]]
H. ∀s[∃p[F(p,Joe) ∧ S(p,s)] => W(Ted,s)]
I. ∀s[W(Ted,s) => ¬L(Joe,s)]

==Problem #2 (prove F is a consequence of A-E)==

=== CNF
A. ∀s: ¬G(s,Blues)   ∨ ¬G(s,Opera)
B. ∀s: ¬W(Amy,s)   ∨ S(Amy,s)
C. ∃s: W(Amy,s)   ∧ G(s,Blues)
D. ∀p,s: ¬F(p,Joe)   ∨ ¬S(p,s) ∨ L(Joe,s)
E. F(Amy,Joe)
F. ∃s: L(Joe,s) ∧ G(s,Opera)

=== remove Quantifiers & break up top-level conjunctions
A. ¬G(s,Blues)   ∨ ¬G(s,Opera)
B. ¬W(Amy,s)   ∨ S(Amy,s)
C1. W(Amy,SK1)
C2. G(SK1,Blues)
D. ¬F(p,Joe)   ∨ ¬S(p,s)   ∨ L(Joe,s)
E. F(Amy,Joe)

=== negate
F' = ¬L(Joe,s) ∨ G(s,Opera)

=== Resolution

G. ¬S(Amy,s)   ∨ L(Joe,s)   (from E + D)
H. ¬G(SK1,Opera)   (from A + C2)
I. S(Amy,SK1)   (from B + C1)
J. L(Joe, SK1)   (from G + I)
K. G(SK1,Opera)   (from H + K)

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==Problem #3 (prove I is a consequence of G+H )==


G. ∀s[ L(Joe,s) => ∃p[ F(p,Joe) ∧ S(s,p) ] ]
   ∀s[ ~L(Joe,s) ∨ ∃p[ F(p,Joe) ∧ S(s,p) ] ]
   ∀s[ ~L(Joe,s) ∨ [F(SK0(s),Joe) ∧ S(s,SK0(s))] ]
   [ ~L(Joe,s) ∨ [F(SK0(s),Joe) ∧ S(s,SK0(s))] ]
   ( ~L(Joe,s) ∨  F(SK0(s),Joe))  ∧  (~L(Joe,s) ∨ S(s,SK0(s)))

H. ∀s[ ∃p[ F(p,Joe) ∧ S(p,s) ] => ~W(Ted,s) ]
   ∀s[ ~∃p[ F(p,Joe) ∧ S(p,s) ] ∨ ~W(Ted,s) ]
   ∀s,p [ ~F(p,Joe) ∨ ~S(p,s)  ∨ ~W(Ted,s) ]



I. ~∀s[ W(Ted,s) => ¬L(Joe,s) ]
    ∃s ~(W(Ted,s) => ¬L(Joe,s))
    ∃s W(Ted,SK2) ∧ L(Joe,SK2)
    W(Ted,SK2) ∧ L(Joe,SK2)

======== CNF
G1. ~L(Joe,s) ∨  F(SK0(s),Joe)
G2. ~L(Joe,s) ∨  S(SK0(s),s)
H.  ~F(p,Joe) ∨ ~S(p,s)  ∨ ~W(Ted,s)
I1. W(Ted,SK2)
I2. L(Joe,SK2)


=== Resolution
J.  F(SK0(SK2),Joe)     (from G1 + I2)
K.  S(SK0(SK2),SK2)     (from G2 + I2)
L.  ~F(p,Joe) ∨ ~S(p,SK2) (from H + I1)
M.  ~S(SK0(SK2),SK2) (from J + L)
N.  ∅ (from K + M)
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