Assignment #7-key

1. (a) ∀xFx ∴ Fm

       ∀xFx
       ¬Fm
        Fm   ∀-instantiation
         *

(b) ∀x¬Lxm ∴ ¬Lnm   or   ¬∃xLxm ∴ ¬Lnm

    ∀x¬Lxm   ¬∃xLxm ✔
     ¬¬Lnm   ¬¬Lnm
      ¬Lnm   ∀-instantiation   ∀x¬Lxm   ¬∃ rule
        *   ¬Lnm   ∀-instantiation
                                   *

(c) ∀x(Gx ⊃ ¬Ix), Gm ∴ ¬Im   or   ¬∃x(Gx ∧ Ix), Gm ∴ ¬Im

     ∀x(Gx ⊃ ¬Ix)   ¬∃x(Gx ∧ Ix) ✔
        Gm   Gm
        ¬¬Im   ¬¬Im
      (Gm ⊃ ¬Im) ✔   ∀-instant.   ∀x¬(Gx ∧ Ix)   ¬∃ rule
         ⟨⟩   ¬(Gm ∧ Im) ✔ ∀-instant.
     ¬Gm   ¬Im   ⊃-rule   ⟨⟩
      *   *   ¬Gm   ¬Im   negated conjunction rule
                                     *   *

(d) ¬In ∴ ¬∀xIx

     ¬In
   ¬¬∀xIx ✔
     ∀xIx   double negation rule
      In   ∀-instant.
       *

(e) (Hn ⊃ ∃x(Ix ∧ ¬Fx)), ∀x(Ix ⊃ Fx) ∴ ¬Hn

      (Hn ⊃ ∃x(Ix ∧ ¬Fx)) ✔
          ∀x(Ix ⊃ Fx)
            ¬¬Hn
            ⟨⟩
     ¬Hn   ∃x(Ix ∧ ¬Fx) ✔
      *   (Ia ∧ ¬Fa) ✔   ∃-instantiation
                Ia
              ¬Fa   ∧-rule
           (Ia ⊃ Fa) ✔   ∀-instantiation
             ⟨⟩
         ¬Ia   Fa   ⊃-rule
          *   *

Extra Credit #1 (Optional).

1.(a) Some business men are millionares but pay no taxes.
   (Some S are not P).
   Subject: Millionare businessmen.   (Bx ∧ Mx)
   Predicate: Things that pay taxes.   Tx
       ∃x((Bx ∧ Mx) ∧ ¬Tx)

(b) Any politician will be impeached if he either has broken the law or abuses his powers.
   (All S are P).
   Subject: Politicians that either break the law or abuse their powers.   (Px ∧ (Lx ∨ Ax))
   Predicate: Things that are impeached.   Ix
       ∀x((Px ∧ (Lx ∨ Ax)) ⊃ Ix)   equivalent to   ∀x((Lx ∨ Ax) ⊃ (Px ⊃ Ix))

(c) Some millionaire businessmen consult a lawyer only if they either have broken the law or are sued.
   (Some S are P).
   Subject: Millionare businessmen.   (Bx ∧ Mx)
   Predicate: Things that consult a lawyer only if they either have broken the law or are sued.
   (Cx ⊃ (Lx ∨ Ux))
       ∃x((Bx ∧ Mx) ∧ (Cx ⊃ (Lx ∨ Ux)))   equivalent to   ¬∀x((Bx ∧ Mx) ⊃ ¬(Cx ⊃ (Lx ∨ Ux)))

(d) Every businessman who pays taxes but doesn't consult a lawyer should have his head examined.
   (All S are P).
   Subject: Businessmen who pay taxes but don't consult lawyers.   ((Bx ∧ Tx) ∧ ¬Cx)
   Predicate: Things that should have their heads examined.   Sx
       ∀x(((Bx ∧ Tx) ∧ ¬Cx) ⊃ Sx)

(e) Some millionare politicians who get sued should have their heads examined only if they are businessmen.
   (Some S are P).
   Subject: Millionare politicians who get sued.   (Mx ∧ Px ∧ Ux)
   Predicate: Things that should have their heads examined only if they are businessmen. (Sx ⊃ Bx)
       ∃x((Mx ∧ Px ∧ Ux) ∧ (Sx ⊃ Bx))