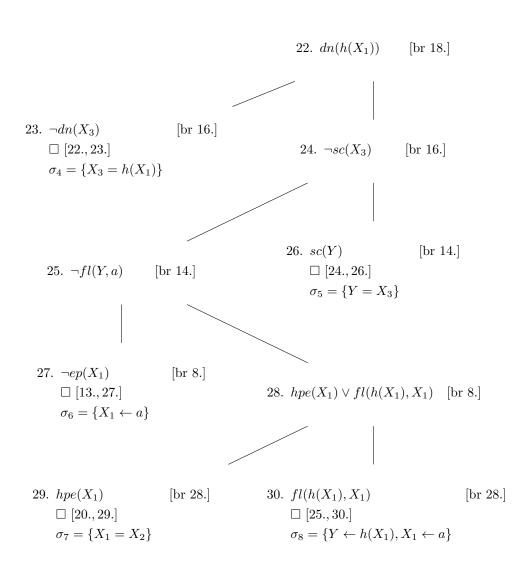
## TD 12. Exercice 2: Correction (Tableaux)

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1. \forall x_1 [ep(x_1) \land \neg hpe(x_1) \Rightarrow \exists y [dn(y) \land fl(y, x_1)]]
     \equiv \forall x \,\exists y \, [(\neg ep(x_1) \vee hpe(x_1) \vee dn(y)) \wedge (\neg ep(x_1) \vee hpe(x_1) \vee fl(y,x_1))]
2. \exists x \ [sc(x) \land ep(x) \land \forall y \ [fl(y,x) \Rightarrow sc(y)]]
     \equiv \exists x \, \forall y \, \left[ sc(x) \wedge ep(x) \wedge (\neg fl(y, x) \vee sc(y)) \right]
3. \forall x_2 [sc(x_2) \Rightarrow \neg hpe(x_2)]
     \equiv \forall x_2 \left[ \neg sc(x_2) \lor \neg hpe(x_2) \right]
4. \neg \exists x_3 [dn(x_3) \land sc(x_3)]
     \equiv \forall x_3 \left[ \neg dn(x_3) \lor \neg sc(x_3) \right]
 5. \forall x \left[ (\neg ep(x_1) \lor hpe(x_1) \lor dn(h(x_1))) \land (\neg ep(x_1) \lor hpe(x_1) \lor fl(h(x_1), x_1)) \right]
                                                                                                                               [ext 1. : \exists y/h(x_1)]
 6. ((\neg ep(X_1) \lor hpe(X_1) \lor dn(h(X_1))) \land (\neg ep(X_1) \lor hpe(X_1) \lor fl(h(X_1), X_1)))
                                                                                                                                 [ext 5. : \forall x_1/X_1]
 7. \neg ep(X_1) \lor hpe(X_1) \lor dn(h(X_1))
                                                                                                                                                [ext 6.]
 8. \neg ep(X_1) \lor hpe(X_1) \lor fl(h(X_1), X_1)
                                                                                                                                                [ext 6.]
 9. \exists x \ [sc(x) \land ep(x) \land (\neg fl(Y, x) \lor sc(Y))]
                                                                                                                                     [ext 2.: \forall y/Y]
10. sc(a) \wedge ep(a) \wedge (\neg fl(Y, a) \vee sc(Y))
                                                                                                                                     [ext 9. : \exists x/a]
11. sc(a)
                                                                                                                                               [ext 10.]
12. ep(a) \wedge (\neg fl(Y, a) \vee sc(Y))
                                                                                                                                               [ext 10.]
13. ep(a)
                                                                                                                                               [ext 12.]
14. \neg fl(Y, a) \lor sc(Y)
                                                                                                                                               [ext 12.]
15. \neg sc(X_2) \lor \neg hpe(X_2)
                                                                                                                                 [ext 3. : \forall x_2/X_2]
16. \neg dn(X_3) \lor \neg sc(X_3)
                                                                                                                                  [ext 4.: \forall x_3/X_3]
     17. \neg ep(X_1)
                                         [br 7.]
           \Box [13., 17.]
                                                                     18. hpe(X_1) \vee dn(h(X_1)) [br 7.]
            \sigma_1 = \{X_1 \leftarrow a\}
     19. \neg sc(X_2)
                                        [br 15.]
           \Box [11., 19.]
                                                                           20. \neg hpe(X_2)
                                                                                                        [br 15.]
           \sigma_2 = \{X_2 \leftarrow a\}
    21. hpe(X_1)
                                         [br 18.]
          \Box [20., 21.]
                                                                           22. dn(h(X_1))
                                                                                                         [br 18.]
          \sigma_3 = \{X_1 = X_2\}
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$$\Sigma = \{X_1 = X_2 \leftarrow a, X_3 = Y \leftarrow h(a)\}$$