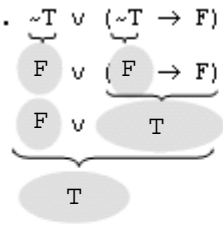
Solutions to Workbook Exercises

Unit 5:

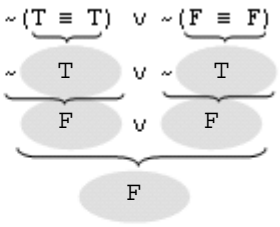
Calculating Truth-Values of Complex Propositions (Part II)

Exercise Truth-Values (B) – 1

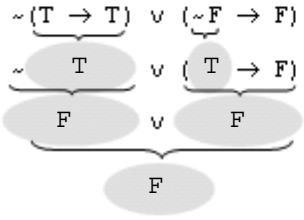
1. $\sim T \vee (\sim T \rightarrow F)$



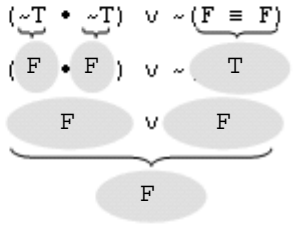
2. $\sim(T \equiv T) \vee \sim(F \equiv F)$



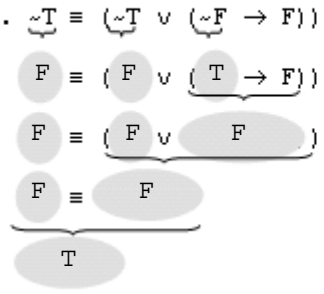
3. $\sim(T \rightarrow T) \vee (\sim F \rightarrow F)$



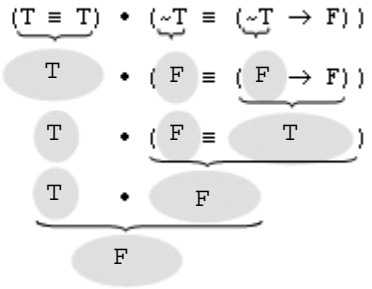
4. $(\sim T \bullet \sim T) \vee \sim(F \equiv F)$



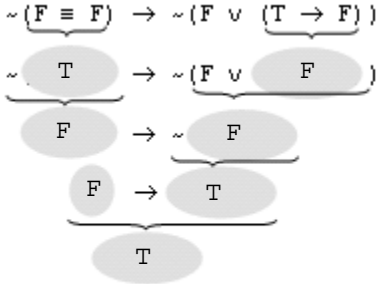
5. $\sim T \equiv (\sim T \vee (\sim F \rightarrow F))$



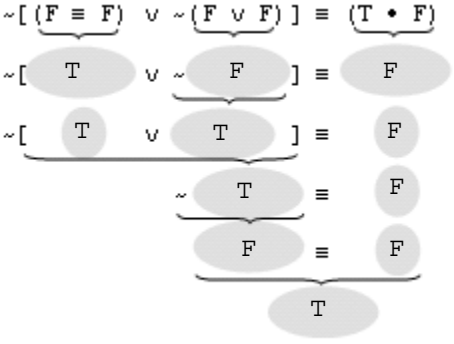
6. $(T \equiv T) \bullet (\sim T \equiv (\sim T \rightarrow F))$



7. $\sim(F \equiv F) \rightarrow \sim(F \vee (T \rightarrow F))$



8. $\sim[(F \equiv F) \vee \sim(F \vee F)] \equiv (T \bullet F)$



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Exercise Truth-Values (B) – 2

1. ~T ∨ T
   F ∨ T
   T

2. ~(T ∨ T)
   ~(T)
   F

3. ~T ∨ ~T
   F ∨ F
   F

4. ~(T → T)
   ~(T)
   F

5. ~T → T
   F → T
   T

6. ~T → ~T
   F → F
   T

7. ~T ∨ (~T → F)
   F ∨ (F → F)
   F ∨ (T)
   T

8. ~T → ~(T ≡ F)
   F → ~(F)
   F → T
   T

9. (~T → ~T) ∨ F
   (F → F) ∨ F
   (T) ∨ F
   T

10. ~(T • T) → F
    ~(T) → F
    F → F
    T

11. (~F ∨ ~F) • (~T ∨ ~T)
    (T ∨ T) • (F ∨ F)
    (T) • (F)
    F

12. ~(F ∨ F) • ~(F ≡ T)
    ~(F) • ~(F)
    T • T
    T

13. ~F → [~F • (~T ∨ ~T)]
    T → [T • (F ∨ F)]
    T → [T • (F)]
    T → [F]
    F

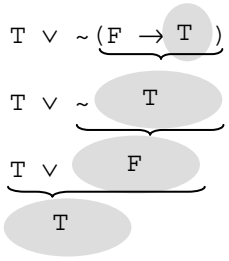
14. ~F • ~[F ∨ (T ≡ T)]
    T • ~[F ∨ (T)]
    T • ~[T]
    T • F
    F

15. [~T ≡ (~F • ~T)] → ~T
    [F ≡ (T • F)] → F
    [F ≡ (F)] → F
    [T] → F
    F

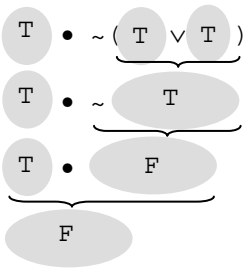
16. ~T • ~[F ∨ ~(T ∨ F)]
    F • ~[F ∨ ~(T)]
    F • ~[F ∨ F]
    F • ~[F]
    F • T
    F

Exercise Truth-Values (B) – 3

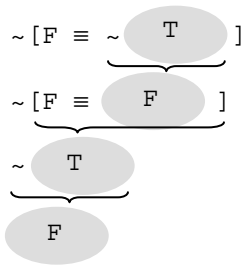
1. T ∨ ~(F → ~F)



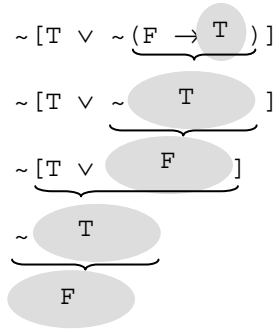
2. ~F • ~(~F ∨ ~F)



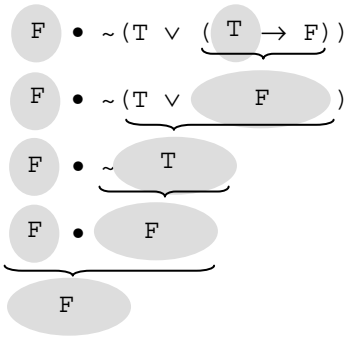
3. ~[F ≡ ~(F ∨ T)]



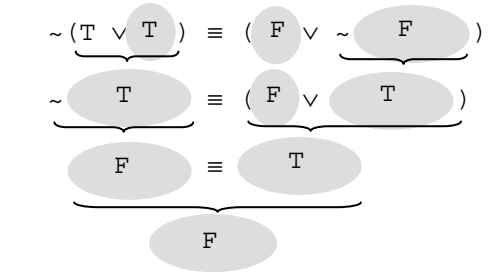
4. ~[T ∨ ~(F → ~F)]



5. ~T • ~(T ∨ (~F → F))



6. ~(T ∨ ~F) ≡ (~T ∨ ~(T → F))



Exercise Truth-Values (B) – 4

1. $(\sim F \bullet \sim T) \equiv \sim(T \equiv \sim F)$
$(T \bullet F) \equiv \sim(T \equiv T)$
$(F) \equiv \sim(T)$
$F \equiv F$
T

2. $\sim(F \vee \sim F) \rightarrow \sim(F \vee \sim T)$
$\sim(F \vee T) \rightarrow \sim(F \vee F)$
$\sim(T) \rightarrow \sim(F)$
$F \rightarrow T$
T

3. $\sim(\sim F \bullet \sim F) \rightarrow \sim(F \rightarrow \sim T)$
$\sim(T \bullet T) \rightarrow \sim(F \rightarrow F)$
$\sim(T) \rightarrow \sim(T)$
$F \rightarrow F$
T

4. $\sim[(\sim F \equiv \sim F) \bullet \sim F]$
$\sim[(T \equiv T) \bullet T]$
$\sim[(T) \bullet T]$
$\sim[T]$
F

5. $\sim[(\sim F \bullet \sim F) \rightarrow \sim(F \rightarrow \sim T)]$
$\sim[(T \bullet T) \rightarrow \sim(F \rightarrow F)]$
$\sim[(T) \rightarrow \sim(T)]$
$\sim[T \rightarrow F]$
$\sim[F]$
T

6. $\sim[(\sim T \equiv \sim F) \bullet \sim F] \rightarrow \sim T$
$\sim[(F \equiv T) \bullet T] \rightarrow F$
$\sim[(F) \bullet T] \rightarrow F$
$\sim[F] \rightarrow F$
$T \rightarrow F$
F

7. $\sim[\sim(T \equiv F) \bullet \sim F] \vee \sim T$
$\sim[\sim(F) \bullet T] \vee F$
$\sim[T \bullet T] \vee F$
$\sim[T] \vee F$
$F \vee F$
F

8. $\sim[\sim(\sim T \vee \sim F) \bullet \sim F] \rightarrow \sim T$
$\sim[\sim(F \vee T) \bullet T] \rightarrow F$
$\sim[\sim(T) \bullet T] \rightarrow F$
$\sim[F \bullet T] \rightarrow F$
$\sim[F] \rightarrow F$
$T \rightarrow F$
F

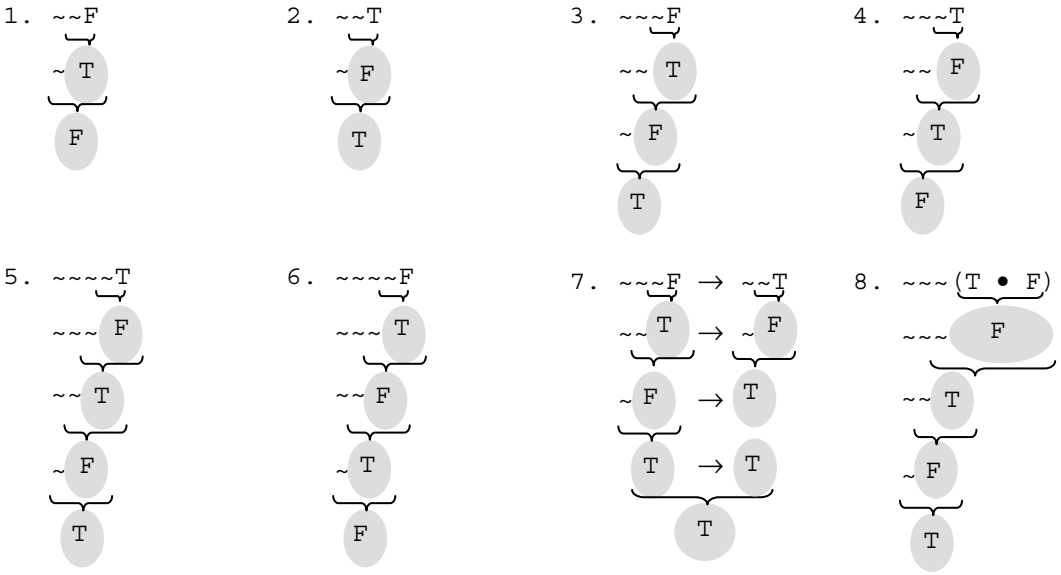
9. $\sim T \vee \sim[\sim F \bullet \sim(T \rightarrow \sim F)]$
$F \vee \sim[T \bullet \sim(T \rightarrow T)]$
$F \vee \sim[T \bullet \sim(T)]$
$F \vee \sim[T \bullet F]$
$F \vee \sim[F]$
$F \vee T$
T

10. $\sim\{T \vee \sim[\sim F \bullet \sim(T \rightarrow \sim F)]\}$
$\sim\{T \vee \sim[T \bullet \sim(T \rightarrow T)]\}$
$\sim\{T \vee \sim[T \bullet \sim(T)]\}$
$\sim\{T \vee \sim[T \bullet F]\}$
$\sim\{T \vee \sim[F]\}$
$\sim\{T \vee T\}$
$\sim\{T\}$
F

11. $\sim\{\sim T \equiv \sim[\sim T \vee \sim(\sim F \bullet \sim F)]\}$
$\sim\{F \equiv \sim[F \vee \sim(T \bullet T)]\}$
$\sim\{F \equiv \sim[F \vee \sim(T)]\}$
$\sim\{F \equiv \sim[F \vee F]\}$
$\sim\{F \equiv \sim[F]\}$
$\sim\{F \equiv T\}$
$\sim\{F\}$
T

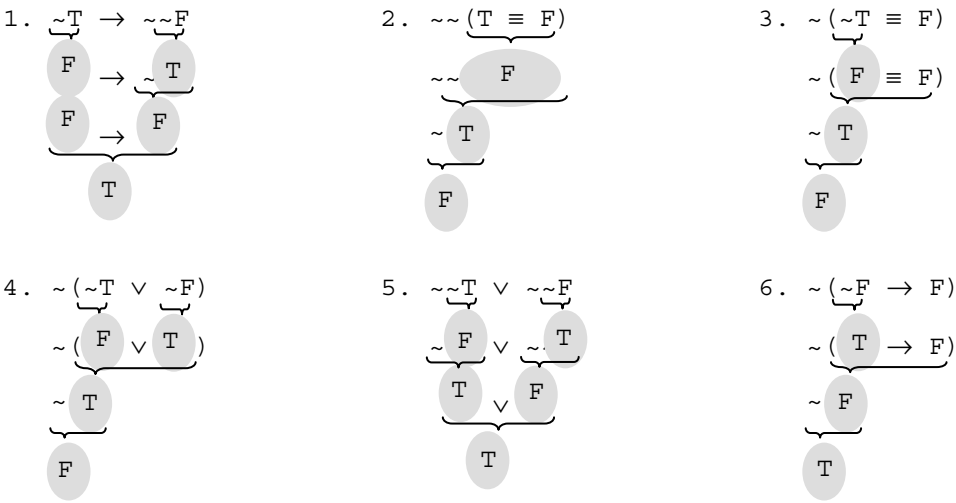
12. $\sim(\sim T \vee \sim F) \equiv \sim[F \equiv \sim(F \bullet \sim F)]$
$\sim(F \vee T) \equiv \sim[F \equiv \sim(F \bullet T)]$
$\sim(T) \equiv \sim[F \equiv \sim(F)]$
$F \equiv \sim[F \equiv T]$
$F \equiv \sim[F]$
$F \equiv T$
F

Exercise Truth-Values Multiple-Negations



Exercise Truth-Values (B) – 5

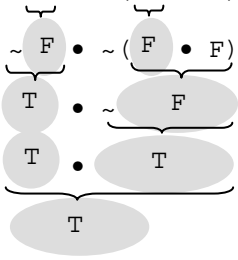
Complete the following calculations. Check that your results match the results in the *Solutions* before proceeding.



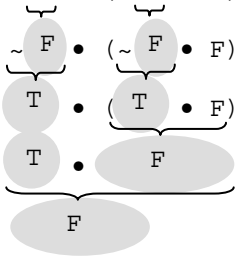
Exercise Truth-Values (B) – 6

In this exercise, you will be provided with the schemata for carrying out the calculations. Make sure that you understand why you proceed in this order. In the next exercises, you will be "on your own." Check that your results match the results in the Solutions before proceeding.

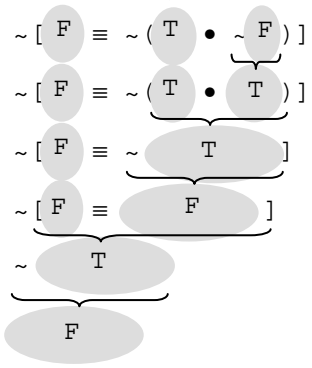
1. ~~T • ~(~T • F)



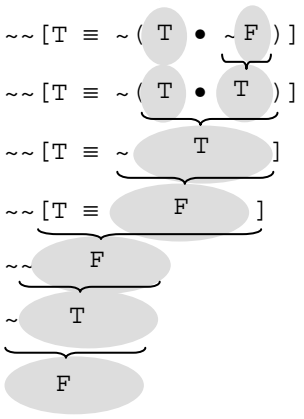
2. ~~T • (~~T • F)



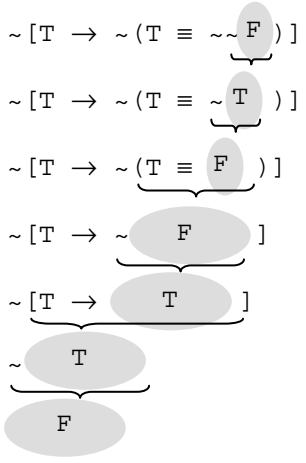
3. ~[~T ≡ ~(~F • ~~T)]



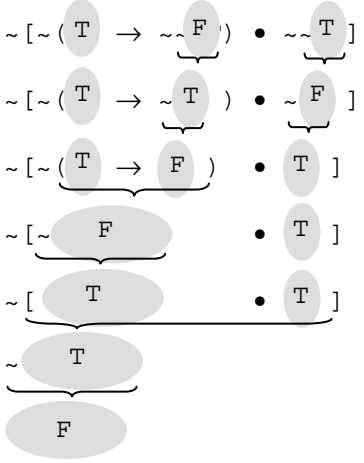
4. ~~[T ≡ ~(~F • ~~T)]



5. ~[T → ~(T ≡ ~~~T)]



6. ~[~(~F → ~~~T) • ~~~F]



Exercise Truth-Values (B) – 7

1. ~~T ∨ ~~F
   ~F ∨ ~T
   T ∨ F
   T

2. ~(~T ∨ ~F)
   ~(F ∨ T)
   ~(T)
   F

3. ~~~F → ~~~~T
   ~~T → ~~~F
   ~F → ~~T
   T → ~F
   T → T
   T

4. ~~~(F → ~T)
   ~~~(F → F)
   ~~~(T)
   ~~F
   ~T
   F

5. ~~(T ∨ ~T)
   ~~(T ∨ F)
   ~~(T)
   ~F
   T

6. ~~(~~T → ~T)
   ~~(~F → F)
   ~~(T → F)
   ~~(F)
   ~T
   F

7. ~(T • ~T) → ~(~F ∨ ~F)
   ~(T • F) → ~(T ∨ T)
   ~(F) → ~(T)
   T → F
   F

8. ~[(~T ∨ ~T) • ~(F ∨ ~F)]
   ~[(F ∨ F) • ~(F ∨ T)]
   ~[(F) • ~(T)]
   ~[F • F]
   ~[F]
   T

9. (F → F) → ~[~(~T ≡ ~F) • ~F]
   (T) → ~[~(F ≡ T) • T]
   T → ~[~(F) • T]
   T → ~[T • T]
   T → ~[T]
   T → F
   F

10. ~[~(~T • T) → ~F] ≡ ~(T ∨ ~F)
    ~[~(F • T) → T] ≡ ~(T ∨ T)
    ~[~(F) → T] ≡ ~(T)
    ~[T → T] ≡ F
    ~[T] ≡ F
    F ≡ F
    T