SOLUTIONS TO SELECTED EXERCISES

EXERCISES FOR SECTION 2.1

PART I

1. Given the form *p*. Case (a): Let *p* be the statement 'Salt Lake City is in Utah'. Then *p* is true. Case (b): Let *p* be the statement 'Salt Lake City is in Nevada'. Then *p* is false.

2. Given the form *It's not the case that p*. Case (a): Let *It's not the case that p* be the statement 'It's not the case that Salt Lake City is in Nevada'. Then *It's not the case that p* is true. Case (b): Let *It's not the case that p* be the statement 'It's not the case that Salt Lake City is in Utah'. Then *It's not the case that p* is false.

4. Given the form *p or q*. Case (a): Let *p or q* be the statement 'Tim is a philosopher or he's an electrician'. Then *p or q* is true. Case (b): Let *p or q* be the statement 'Tim is a sociologist or he's a taxidermist'. Then *p or q* is false.

5. Given the form *p if and only if q*. Case (a): Let *p if and only if q* be the statement 'Sheila is a bachelor if and only if she's an unmarried male'. Then *p if and only if q* is true. Case (b): Let *p if and only if q* be the statement 'Sheila is a bachelor if and only if she's a married male'. Then *p if and only if q* is false.

6. Given the form *If p, then it's not the case that q*. Case (a): Let *If p, then it's not the case that q* be the statement 'If Sheila is a bachelor, then it's not the case that she's married'. Then *If p, then it's not the case that q* is true. Case (b): Let *If p, then it's not the case that q* be the statement 'If Sheila is a bachelor, then it's not the case that she's unmarried'. Then *If p, then it's not the case that q* is false.

7. Given the form *Either not p or not q*. Case (a): Let *Either not p or not q* be the statement 'Either Tim is not a philosopher or he's not an electrician'. Then *Either not p or not q* is true. Case (b): Let *Either not p or not q* be the statement 'Tim is not a philosopher or he's not a teacher'. Then *Either not p or not q* is false.

8. Given the form *If it's not the case that p, then q*. Case (a): Let *If it's not the case that p, then q* be the statement 'If Stan's not married, then he's a bachelor'. Then *If it's not the case that p, then q* is true. Case (b): Let *If it's not the case that p, then q* be the statement 'If Stan's not married, then he's a husband'. Then *If it's not the case that p, then q* is false.

10. Given the form *If p, then q and not r*. Case (a): Let *If p, then q and not r* be the statement 'If Stan is a bachelor, then he's male and he's not married'. Then *If p, then q and not r* is true. Case (b): Let *If p, then q and not r* be the statement 'If Stan is a bachelor, then he's married and he's not male'. Then *If p, then q and not r* is false.

PART II

11. $p \rightarrow q$
p
$\therefore q$

12. $p \rightarrow q$
q
$\therefore p$

13. Either it's raining or it's raining.
$\therefore$ It's raining.

EXERCISES FOR SECTION 2.2

1. Truth-functionally simple.

2. Truth-functionally compound. The simple statements are 'Melody teaches Marxism' and 'Melody is happy'.

4. Truth-functionally simple.

5. Truth-functionally compound. The simple statements are 'Betty will get up early' and 'Circumstances are extreme'.

6. Truth-functionally compound. The simple statements are 'There is nobody in the shower' and 'The water is on'.

7. Truth-functionally compound. The simple statement is 'The television is working'.

8. Truth-functionally compound. The simple statements are 'The television is working' and 'The radio is working'.

10. Truth-functionally simple.

11. Truth-functionally simple.

12. Truth-functionally simple.

14. Truth-functionally compound. The simple statement is 'I have been involved in wrongdoing'.

15. Truth-functionally simple.

16. Truth-functionally compound. The simple statements are ‘The man walked up to the stand’ and ‘The man ordered an ice cream cone’.

17. Truth-functionally simple.

18. Truth-functionally simple.

20. Truth-functionally compound. The simple statement is ‘Ellen is known to avoid a good book on transformational grammar’.

21. Truth-functionally simple. (See p. 41 of the textbook.)

22. Truth-functionally compound. The simple statement is ‘Jack’s father is unhappy’.

23. Truth-functionally simple.

24. Truth-functionally simple.

25. Truth-functionally compound. The simple statements are ‘The fire started because a match was lit’ and ‘The fire was soon put out’.

26. Truth-functionally simple.

27. Truth-functionally simple.

EXERCISES FOR SECTION 2.3

1. M: I went to the Moon yesterday. **~M**

2. M: I went to the Moon yesterday. **~M**

4. B: I have eaten the last banana. **~B**

5. T: It is possible to travel backward in time. **~T**

6. S: Socrates’ argument is valid. **~S**

7. C: There is a computable utility function. **~C**

8. I: Inkyo will wear socks. **~I**

10. B: Betty is macabre; O: Bob is macabre. **(B & O)**

11. B: Betty is macabre; O: Bob is macabre. **(B & O)**

12. S: Tom is six foot two; E: Tom has eyes of blue. **(S & E)**

13. S: Smoking is permitted; N: No one is smoking. **(S & N)**

14. F: We have free will; G: God knows everything we're doing. **(F & G)**

15. W: Women have studied logic; M: Men have studied logic. **(W & M)**

16. F: The first little piggy had roast beef; S: The second little piggy had none. **(F & S)**

17. C: The cat is away; M: The mice are away. **(C $\vee$ M)**

18. Y: Sylvia will show up at the party; A: Sally will show up at the party. **(Y $\vee$ A)**

20. M: You have won a million dollars; F: You have won a faux diamond necklace. **(M $\vee$ F)**

21. C: My cat ate my shoes; D: My dog ate my shoes. **(C $\vee$ D)**

22. S: Smoking is allowed; L: I am leaving. **(S $\rightarrow$ L)**

23. C: Creationism is a good theory; N: All good theories are naively falsifiable. **(C $\rightarrow$ N)**

24. M: Bernice has music; E: Bernice really enjoys life. **(E $\rightarrow$ M)**

26. U: Ratso understands Maxwell's equations for electromagnetism; S: Ratso can solve the equation. **(U $\rightarrow$ S)**

27. A: Annie will solve the problem before Ratso; R: Ratso tries to use linear regression analysis. **(R $\rightarrow$ A)**

28. M: Miracles exist; O: Omnipotent Olivia has the power to change the laws of physics. **(O $\rightarrow$ M)**

29. L: Lovely promises undying passion; C: Candice will reconsider the proposal of marriage. **(C $\rightarrow$ L)**

30. L: Lovely promises undying passion; C: Candice reconsiders the proposal of marriage. **(L $\leftrightarrow$ C)**

32. T: Tachyons exist; F: There are faster-than-light particles. **(T & F) $\vee$ (~T & ~F)** *–or–* **(T $\leftrightarrow$ F)**

33. R: I will allow you to read the comics; G: You give me the front page. **(R ↔ G)**

EXERCISES FOR SECTION 2.4

PART I

2. L: Luc will stay at the party; A: Andy will stay at the party. **(L ∨ A) & ~(L & A)**

3. L: Luc will stay at the party; A: Andy will stay at the party; S: Sam will stay at the party. **[(L & A) ∨ (L & S) ∨ (A & S)] & ~[L & (A & S)]**

4. S: Some laws of physics are deterministic; A: All laws of physics are deterministic. **S & ~A**

6. S: Special relativity is generally thought to be compatible with complete physical determinism; Q: Quantum mechanics is generally thought to be compatible with complete physical determinism. **S & ~Q**

7. W: Light is a wave phenomenon; P: Light is a particle phenomenon. **~(W & P)**

8. E: Some existentialists are theists; S: Sartre was a theist; F: Sartre believed that faith plays a fundamental role in all our beliefs. **[(E & ~S) & F]**

9. P: Heidegger's *Sein und Zeit* was possible; R: Heidegger had read the works of Husserl; U: Heidegger had understood the works of Husserl. **P → (R & U)**

10. S: A person's hidden motives are often revealed by slips of the tongue; R: We have good reason to try to interpret slips of the tongue. **S & (S → R)**

12. D: Larson deals with his hurt feelings; S: Larson completely suppresses his hurt feelings; F: Larson will be able to function. **(~D & ~S) → ~F** *–or–* **~(D ∨ S) → ~F**

13. M: I am mistaken; C: You have a large, multilegged creature crawling on your shoulder. **~M → C**

14. K: Kate wins a karate title; W: Williams wins a karate title; C: Kelly competes this summer; T: Kelly will have a tough pair of challengers to face.
(K & W) → (C → T)

16. W: War will occur; N: There are nuclear weapons. **~(W ↔ N)**

17. P: World peace will be achieved; E: Every country has equal power; R: Russia has nuclear missiles; C: China has nuclear missiles. **(P → E) → [(R & ~C) → ~P]**

PART II

18. E: Sam is still full of energy; T: Luc is tired; G: Sam can have a good time.

E & T
T → ~G
\ **~G**

20. C: Coke is a carbonated drink; P: Pepsi is a carbonated drink; M: Carbonated drinks upset Martin's stomach; U: Martin's stomach will be upset; O: Martin drinks Coke; E: Martin drinks Pepsi.

C & P
M
\ **(O ∨ E) → U**

21. O: Martin drinks Coke; E: Martin drinks Pepsi; A: Martin falls asleep; B: Martin burps a lot; D: Maurice is disgusted.

[(O & E) → A] & [((O ∨ E) & ~(O & E)) → B]
B → D
\ **[D → ~(O & E)]**

22. M: The mockingbird will sing; D: I will buy you a diamond ring; B: The diamond ring turns brass; L: I will buy you a looking glass; G: The looking glass breaks; A: I will buy you a billy goat; C: The billy goat takes logic; S: The billy goat is pretty smart.

~M → D
B → L
G → A
C → S
~M
\ **S**

24. W: William does his homework before ten o'clock; T: William watches television; V: William will see images of violence; A: William will see advertising.

W → T
T → (V & A)
\ **W → A**

25. N: There is a nuclear war; U: It will be started by the United States; R: It will be started by Russia.

N → (U ∨ R)
~U & ~R
\ ~N

26. G: The game will be won; S: Samson is allowed to play; T: Samson is tied up for a while.

G ↔ S
T & (T → ~S)
\ ~G

27. O: The concert will be given outside; R: There is rain; A: The concert will be held in the auditorium; H: Many people will stay at home; W: The concert will be well attended.

~R → O
R → A
~A → H
H → ~W
\ W → R

28. E: Einar opens his diner, called 'The Forty-Niner'; F: There will be finer food; D: Del will have a real choice for dining out; H: Hoggy Diner will be the best buy for fast food; G: Hoggy Diner fast food is very good; C: Hoggy Diner fast food gives Del a real choice for dining out; A: Del will stay around.

E → (~F & D)
~E → H
~G & ~C
~D → ~A
\ ~E → ~A

30. ***SKIP!***

31. E: Ethical relativism is true; O: There are objective moral values; K: Kantianism is true; S: Some other ethical theory is true.

E → ~O
K → O
~(E & K)
\ (O & ~K) → S

32. V: Exercise 32 is a valid argument; P: Exercise 32's premises are true; C: Exercise 32's conclusion is true.

V ↔ ~(P & ~C)
~C & P
\ ~V

EXERCISES FOR SECTION 2.4

PART I

1. We are given the form *p*.
   a) This statement *can* be obtained from the given form *p*.
   b) This statement *can* be obtained from the given form *p*.
   c) This statement *can* be obtained from the given form *p*.

2. We are given the form ~(*p* & *q*).
   a) This statement can*not* be obtained from the given form ~(*p* & *q*).
   b) This statement *can* be obtained from the given form ~(*p* & *q*).
   c) This statement can*not* be obtained from the given form ~(*p* & *q*).

3. See the solution in the back of the textbook, p. 433.

4. We are given the form ((*p* & *q*) ∨ *r*).
   a) This statement *can* be obtained from the given form ((*p* & *q*) ∨ *r*).
   b) This statement can*not* be obtained from the given form ((*p* & *q*) ∨ *r*).
   c) This statement can*not* be obtained from the given form ((*p* & *q*) ∨ *r*).

5. We are given the form (*p* & (~*p* → *q*)).
   a) This statement can*not* be obtained from the given form (*p* & (~*p* → *q*)).
   b) This statement can*not* be obtained from the given form (*p* & (~*p* → *q*)).
   c) This statement can*not* be obtained from the given form (*p* & (~*p* → *q*)).

PART II

6. This is an *SL* statement. It is a statement letter, and all statement letters are *SL* statements.
7. See the solution in the back of the textbook, p. 433.
8. This is *not* an *SL* statement. ',' is not an *SL* connective.
9. This is an *SL* statement. It has the logical form of a biconditional; '↔' is its main connective.
10. This is an *SL* statement. It has the logical form of a disjunction; '∨' is its main connective.
11. This is *not* an *SL* statement. Parentheses are needed around either 'A → B' or

'B → C'.

12. This is an *SL* statement. It has the logical form of a conjunction; '&' is its main connective. (The parentheses around 'B' are OK (since 'B' is a statement letter and therefore an *SL* statement), but we might just have well have done without them.)
13. See the solution in the back of the textbook, p. 433.
14. This is an *SL* statement. It has the logical form of a biconditional; '↔' is its main connective.
15. This is an *SL* statement. It has the logical form of a biconditional; '↔' is its main connective. (Here again, the parentheses around 'A' are OK (since 'A' is a statement letter and therefore an *SL* statement), but we might just have well have done without them. The parentheses are '~R' are OK, too, since that's an SL statement, but we might just as well have done without *them*, too, as in #21.)
16. This is an *SL* statement. It has the logical form of a conditional; '→' is its main connective.
17. This is *not* an *SL* statement. '~' can immediately precede *only* a statement letter or a punctuation symbol (or another tilde, as in #21), and so it can *not* immediately precede a different connective symbol.
18. This is *not* an *SL* statement. It seems here that '→' is used as a *one*-place connective (like '~'), but it is a *two*-place connective; it connects one statement with another.
19. See the solution in the back of the textbook, p. 433.
20. This is *not* an *SL* statement. It seems here that '~' is used as a *two*-place connective (like '&', '∨', '→', and '↔'), but it is a *one*-place connective.
21. This is an *SL* statement. It has the logical form of a negation; '~' is its main connective.