C: ANSWERS TO SELECTED PROBLEMS

Chapter 8.1, Maximum Problems and Slack Variables

1. $20x + 100y + u = 1900,\ x + 50y + v = 500,\ 2x + 20y + w = 240$.

3a. $x + y + u = 6,\ y + v = 5$.

3b. $-x - 2y + f = 0$.

3c.

x	y	u	v	f	1
1	1	1	0	0	6
0	1	0	1	0	5
–1	–2	0	0	1	0

3d. 2

3e. 2

5a. $x + y + v = 5,\ .$
$4x + 5y + w = 13$

5b. $-5x - 4y + f = 0$.

5c.

x	y	u	v	w	f	1
3	2	1	0	0	0	12
1	1	0	1	0	0	5
4	6	0	0	1	0	13
–5	–4	0	0	0	1	0

5d. 2

5e. 3

7a. $-4x + 3y + 2z + v = 4,.$
$3x + y - 6z + w = 6$

7b. $2y - 5z + f = 0$.

7c.

x	y	z	u	v	w	f	1
3	–2	1	1	0	0	0	8
–4	3	2	0	1	0	0	4
3	1	–6	0	0	1	0	6
0	2	–5	0	0	0	1	0

7d. 3

7e. 3

Chapter 8.2, The Simplex Method

1. Max $f = 11,\ x = 1,\ y = 5$.
3. Max $f = 30,\ x = 2,\ y = 6$.
5. Max $f = 90,\ x = 30,\ y = 0$.
7. Max $f = 79,\ x = 9,\ y = 4$.
9. Max $f = \frac{75}{4},\ x = 0,\ y = \frac{9}{4},\ z = \frac{19}{4}$.
11. Max profit \$90, 0 A, 0 B, and 3 C.
13. Max income \$20,220, 16 inexpensive, 30 expensive, and 14 medium.
15. Max income \$82 million, \$0 home, \$600 million car, and \$200 million securities.

Chapter 8.3, Duality and Minimum Problems

1. Min $y_0 = 1900\ y_1 + 500 y_2 + 240 y_3$
$20y_1 + y_2 + 2y_3 \geq 20,$
$100 y_1 + 50 y_2 + 20 y_3 \geq 300,$
$y_1, y_2, y_3 \geq 0.$

3. No solution.

5. Primal solution: $y_1 = 5,\ y_2 = 7,\ x_1 = x_2 = 0,\ x_3 = 1,\ y_0 = 53$.

7. Primal solution: $y_1 = \frac{8}{11},\ y_2 = \frac{2}{11},\ y_3 = x_1 = x_2 = 0,\ x_3 = \frac{13}{11},\ y_0 = \frac{82}{11}$.
9. Minimal cost $\$36\frac{12}{13}$ using $1\frac{11}{13}$ sacks of soybeans and $1\frac{11}{13}$ sacks of oats.
11. 4 days A and 2 days B.

Chapter 8.4, Mixed-Constraint Linear Programs

No problems in this section.

Chapter 8.5, Chapter Review

1. Max $f = 43,\ x = 2,\ y = 7$.
3. Max $f = 59,\ x = 11,\ y = 5$.
5. $x_1 = 0,\ x_2 = 5,\ x_3 = 1,\ y_1 = 2,\ y_2 = 0,\ y_0 = 10$.
7. $y_1 = \frac{62}{7},\ y_2 = \frac{60}{7},\ x_1 = 0,\ x_2 = \frac{10}{7},\ x_3 = 0,\ y_0 = \frac{428}{7}$.
9. Min $T = 18,\ x = 2,\ y = 4$.
11. Max \$82,500, 125 X, 50 Y, and 0 Z