

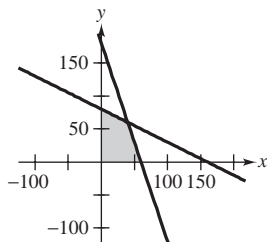
37.

	Outlet I	Outlet II
Plant A	$a$	$5000 - a$
Plant B	$3000 - a$	$a$

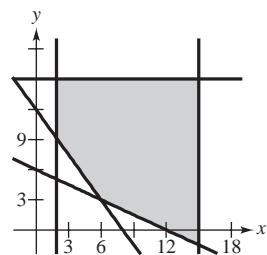
Minimum cost: \$40,000

REVIEW EXERCISES – CHAPTER 9 (page 531)

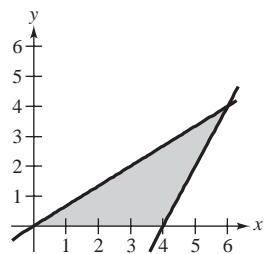
1.



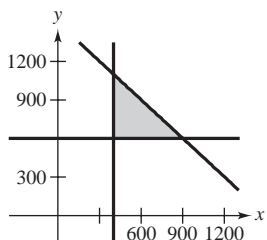
3.



5.



7.  $x + y \leq 1500$ ,  $x \geq 400$ ,  $y \geq 600$



- 9. Maximum is 47 at (5, 8)
- 11. Minimum is 3 at (3, 0)  
Maximum is 29 at (5, 8)
- 13. Minimum is  $-6$  at (0, 6)  
Maximum is  $\frac{64}{3}$  at  $(8, \frac{8}{3})$
- 15. Maximum is 26 at (12, 7)
- 17. Maximum is 20 at (0, 9.6, 0.8)
- 19. Maximum is 232 at (100, 132)
- 21. Maximum is 3599 at (110, 537, 146)
- 23. (Maximize) Objective function:  
 $z = 30y_1 + 75y_2$   
Constraints:  
 $y_1 + 3y_2 \leq 7$   
 $y_1 + 6y_2 \leq 3$   
 $2y_1 + 4y_2 \leq 1$   
 $y_1, y_2 \geq 0$
- 25. Minimum is 75 at (5, 2)
- 27. Minimum is 6006 at  $(\frac{81}{2}, 138, 111)$
- 29. Minimum is  $\frac{118}{3}$  at  $(\frac{4}{3}, \frac{1}{3}, 0)$
- 31. Maximum is 31 at (1, 15)
- 33. Maximum is 67 at (7, 27, 26)
- 35. Minimum is 90 at (10, 0, 0)
- 37. Maximum is \$500 for 2 vests and 5 purses.
- 39. Minimum is \$4800 for 7 days on mine A, 5 days on mine B, and 24 days on mine C.

Chapter 10

SECTION 10.1 (page 541)

- 1.  $0.4281 \times 10^4$
- 3.  $-0.262 \times 10^1$
- 5.  $-0.121 \times 10^{-2}$
- 7.  $0.125 \times 10^0$
- 9. (a)  $0.331 \times 10^3$
- 11. (a)  $-0.926 \times 10^2$
- (b)  $0.3310 \times 10^3$
- (b)  $-0.9265 \times 10^2$
- 13. (a)  $0.438 \times 10^0$
- 15. (a)  $0.143 \times 10^0$
- (b)  $0.4375 \times 10^0$
- (b)  $0.1429 \times 10^0$
- 17. Approximate:  $-3700$   
Exact:  $-3694.7352$
- 19. Approximate:  $x = 23.8, y = 0$   
Exact:  $x = 10, y = 1$

- |                             |                          |
|-----------------------------|--------------------------|
| Without Partial<br>Pivoting | With Partial<br>Pivoting |
|-----------------------------|--------------------------|
21.  $x = 2.04$        $x = 1$   
 $y = 0$              $y = 1$
- |                             |                          |
|-----------------------------|--------------------------|
| Without Partial<br>Pivoting | With Partial<br>Pivoting |
|-----------------------------|--------------------------|
23.  $x_1 = -0.0899$        $x_1 = -0.493$   
 $y_2 = 0$                  $y_2 = 0.100$   
 $z_3 = 20.2$              $z_3 = 20.1$
25.  $x = 9000$                       27.  $x = 2$  and  $x = 1$   
 $y = -9000$                          $y = 0$        $y = 1$
29.  $x_1 = -4.5$   
 $x_2 = 19$   
 $x_3 = -12$

## SECTION 10.2 (page 549)

1.  $x_1 = 1.00$                       3.  $x_1 = 2.00$   
 $x_2 = 1.00$                          $x_2 = 2.00$   
      $x_3 = 2.00$
5.  $x_1 = 1.00$                       7.  $x_1 = 2.00$   
 $x_2 = 1.00$                          $x_2 = 2.00$   
      $x_3 = 2.00$

9.

$n$	0	1	2	3	4	...
$x_1$	0.000	-1.00	9.00	-31.0	129	...
$x_2$	0.000	5.00	-15.00	65.0	-255	...

11.

$n$	0	1	2	3	4	...
$x_1$	0.000	-3.50	2.75	117.0	-33.8	...
$x_2$	0.000	4.17	80.40	-20.2	-1114.0	...
$x_3$	0.000	23.50	4.75	-338.0	114.0	...

13. Strictly diagonally dominant

15. Not strictly diagonally dominant

17.  $x_1 = 1.0$                       19.  $x_1 = 4.00$   
 $x_2 = 1.0$                          $x_2 = 5.00$   
      $x_3 = 1.00$

21. Jacobi Method

$n$	0	1	2	3	4	...	31
$x_1$	0.00	-0.250	1.625	1.781	0.609	...	1
$x_2$	0.00	1.500	1.625	0.688	0.609	...	1

## Gauss-Seidel Method

$n$	0	1	2	3	4	...	19
$x_1$	0.00	-0.250	1.781	0.512	1.305	...	1
$x_2$	0.00	1.625	0.609	1.244	0.847	...	1

23. 10 REM —————&gt; Gauss-Seidel Method &lt;—————

```

15 LET X1 = 0
20 LET X2 = 0
25 LET X3 = 0
30 LET X4 = 0
35 LET X5 = 0
40 LET X6 = 0
45 LET X7 = 0
50 LET X8 = 0
55 LET E = 1
60 IF E < .001 THEN GOTO 195
65 LET T1 = X1
70 LET T2 = X2
75 LET T3 = X3
80 LET T4 = X4
85 LET T5 = X5
90 LET T6 = X6
95 LET T7 = X7
100 LET T8 = X8
105 LET X1 = 3/4 + (-X2 + X3)/4
110 LET X2 = -1 + (-X1 + 2*X3 - X4 + X5)/6
115 LET X3 = -1 + (-X2 + X5 - X6)/5
120 LET X4 = (-2*X2 + X5 + X7 + X8)/5
125 LET X5 = 2 + (X3 + X4 + X6 + X8)/6
130 LET X6 = -12/5*(X3 + X5)/5
135 LET X7 = -1/2 + (X4 + X8)/4
140 LET X8 = 2/5 + (X4 + X5 + X7)/5
145 LET E = ABS(T1 - X1)
150 IF ABS(T2 - X2) > E THEN LET E =
ABS(T2 - X2)
155 IF ABS(T3 - X3) > E THEN LET E =
ABS(T3 - X3)
160 IF ABS(T4 - X4) > E THEN LET E =
ABS(T4 - X4)
165 IF ABS(T5 - X5) > E THEN LET E =
ABS(T5 - X5)
170 IF ABS(T6 - X6) > E THEN LET E =
ABS(T6 - X6)
175 IF ABS(T7 - X7) > E THEN LET E =
ABS(T7 - X7)

```

```

180 IF ABS(T8 - X8) > E THEN LET E =
    ABS(T8 - X8)
185 PRINT "*";
190 GOTO 60
195 PRINT
200 PRINT "The final solution is:"
205 PRINT " X1 = "; PRINT USING "###.###";X1
210 PRINT " X2 = "; PRINT USING "###.###";X2
215 PRINT " X3 = "; PRINT USING "###.###";X3
220 PRINT " X4 = "; PRINT USING "###.###";X4
225 PRINT " X5 = "; PRINT USING "###.###";X5
230 PRINT " X6 = "; PRINT USING "###.###";X6
235 PRINT " X7 = "; PRINT USING "###.###";X7
240 PRINT " X8 = "; PRINT USING "###.###";X8
245 END

```

\*\*\*\*\*

The final solution is :

```

X1 = 1.000
X2 = -1.000
X3 = 0.000
X4 = 1.000
X5 = 2.000
X6 = -2.000
X7 = 0.000
X8 = 1.000

```

### SECTION 10.3 (page 557)

1.  $\lambda = -4, 2$

$$\begin{bmatrix} 1 \\ -6 \end{bmatrix}$$

5.  $\lambda = -1, 2, 3$

$$\begin{bmatrix} 5 \\ 1 \\ 2 \end{bmatrix}$$

7.  $\lambda = 2$

3.  $\lambda = -4, 4$

No dominant eigenvector

9.  $\lambda = -3$

11.  $\mathbf{x}_5 = \begin{bmatrix} -0.1132 \\ 1.0000 \end{bmatrix}, \lambda \approx -6.998$

13.  $\mathbf{x}_5 = \begin{bmatrix} -0.5 \\ 1.0 \end{bmatrix}, \lambda = 9$

15.  $\mathbf{x}_4 = \begin{bmatrix} 0.0156 \\ 0.0041 \\ 1.0000 \end{bmatrix}, \lambda \approx 8.0068$

17.  $\mathbf{x}_4 = \begin{bmatrix} -0.9984 \\ 1.0000 \\ 0.1673 \end{bmatrix}, \lambda \approx 5.0061$

19.  $\mathbf{x}_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}, \mathbf{x}_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \mathbf{x}_3 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}, \mathbf{x}_4 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

21. (a) Eigenvalues: 2, 5

Eigenvectors:  $(1, 1), (-\frac{1}{2}, 1)$

(b)  $\mathbf{x}_0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \mathbf{x}_2 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$

(c) Because the initial guess was an eigenvector for  $\lambda = 2$ .

23.  $\lambda \approx -0.982$  (Actual value is  $\lambda = -1$ .)

25. (a) A:  $\lambda = 1, 3$

B:  $\lambda = 1, 5$

(b) A:  $\mathbf{x}_0 = \begin{bmatrix} -1 \\ 2 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \mathbf{x}_2 = \begin{bmatrix} 0.5 \\ 1 \end{bmatrix}, \mathbf{x}_3 = \begin{bmatrix} 0.8 \\ 1 \end{bmatrix},$

$$\mathbf{x}_4 = \begin{bmatrix} 0.929 \\ 1 \end{bmatrix}$$

B:  $\mathbf{x}_0 = \begin{bmatrix} -1 \\ 2 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 0.57 \\ 1 \end{bmatrix}, \mathbf{x}_2 = \begin{bmatrix} 0.906 \\ 1 \end{bmatrix},$

$$\mathbf{x}_3 = \begin{bmatrix} 0.981 \\ 1 \end{bmatrix}, \mathbf{x}_4 = \begin{bmatrix} 0.996 \\ 1 \end{bmatrix}$$

(c) A:  $\frac{\lambda_2}{\lambda_1} = \frac{1}{3}$

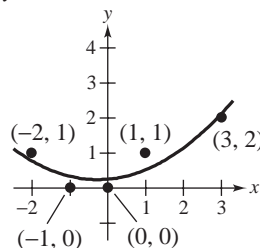
B:  $\frac{\lambda_2}{\lambda_1} = \frac{1}{5}$

B should converge faster.

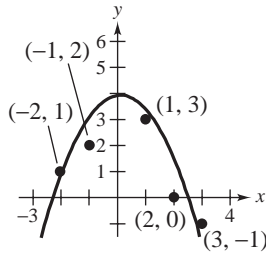
27.  $\lambda \approx 9.000$

### SECTION 10.4 (page 566)

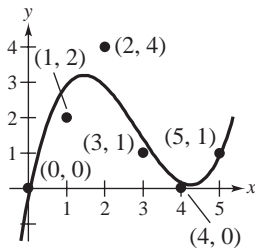
1.  $y = 0.1760x^2 + 0.0935x + 0.2533$



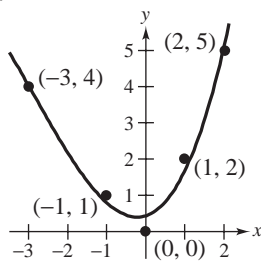
3.  $y = -0.6786x^2 + 0.1357x + 3.9143$



5.  $y = 0.287x^3 - 2.456x^2 + 5.336x - 0.254$



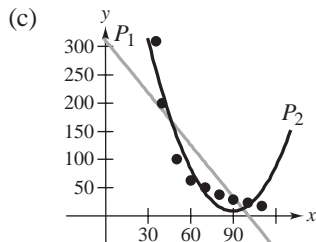
7.  $y = 0.09434x^3 + 0.7922x^2 + 0.3518x + 0.4313$



9.  $y = -0.397x^2 + 0.966x$ ,  $y\left(\frac{\pi}{4}\right) = 0.721$  (Exact: 0.707)

11. (a)  $p_1(x) = 310.7 - 3.088x$

(b)  $p_2(x) = 0.08579x^2 - 15.37x + 696.8$



(d)  $p_1(120) = -59.9$ ,  $p_2(120) = 87.8$

13. Let  $x = 0$  represent 1977.

$$y = 0.2856x^2 + 4.139x + 22.62$$

1986 ( $x = 9$ ): 83.00

1988 ( $x = 11$ ): 102.7

15. Let  $x = 0$  represent 1970.

$$y = 0.0676x + 3.778$$

1990 ( $x = 20$ ): 5.13

1995 ( $x = 25$ ): 5.47

17.  $p_1 = 0.1553$   $p_2 = 0.2050$

$p_3 = 0.1553$   $p_4 = 0.4162$

$p_5 = 0.5093$   $p_6 = 0.4162$

19.  $t_1 = 85.7143$   $t_2 = 71.4286$

$t_3 = 50.0000$   $t_4 = 71.4286$

$t_5 = 50.0000$   $t_6 = 28.5714$

$t_7 = 50.0000$   $t_8 = 28.5714$

$t_9 = 14.2857$

21.  $\mathbf{x} = t \begin{bmatrix} 4 \\ 1 \end{bmatrix}$

23.  $\mathbf{x} \approx t \begin{bmatrix} 1.0000 \\ 0.5652 \\ 0.1597 \end{bmatrix}$

25.  $\mathbf{x} = t \begin{bmatrix} 16 \\ 4 \\ 1 \end{bmatrix}$

29.  $\mathbf{x} \approx t \begin{bmatrix} 1.0000 \\ 0.4750 \\ 0.4500 \end{bmatrix}$