

# Chapter 8

## Section 8.1 (page 562)

2.  $1 \times 4$     4.  $3 \times 4$     6.  $1 \times 1$

8. 
$$\begin{bmatrix} 7 & 4 & \vdots & 22 \\ 5 & -9 & \vdots & 15 \end{bmatrix}$$

10. 
$$\begin{bmatrix} -1 & -8 & 5 & \vdots & 17 \\ -6 & 0 & 12 & \vdots & -24 \\ 3 & 1 & -8 & \vdots & 11 \end{bmatrix}$$

12. 
$$\begin{cases} 7x - 5y = 0 \\ 8x + 3y = -2 \end{cases}$$

14. 
$$\begin{cases} 6x + 2y - z - 5w = -25 \\ -x + 7z + 3w = 7 \\ 4x - y - 10z + 6w = 23 \\ 8y + z - 11w = -21 \end{cases}$$

16. Reduced row-echelon form    18. Row-echelon form

20. 
$$\begin{bmatrix} 1 & 2 & \frac{8}{3} \\ 4 & -3 & 6 \end{bmatrix}$$

22. 
$$\begin{bmatrix} 1 & 2 & 4 & \frac{3}{2} \\ 1 & -1 & -3 & 2 \\ 2 & 6 & 4 & 9 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 4 & \frac{3}{2} \\ 0 & -3 & -7 & \frac{1}{2} \\ 0 & 2 & -4 & 6 \end{bmatrix}$$

24. Add 3 times  $R_1$  to  $R_2$ .    26. Add 5 times  $R_1$  to  $R_3$ .

28. (a) 
$$\begin{bmatrix} 7 & 1 \\ 0 & 2 \\ -3 & 4 \\ 1 & 5 \end{bmatrix}$$
    (b) 
$$\begin{bmatrix} 1 & 5 \\ 0 & 2 \\ -3 & 4 \\ 7 & 1 \end{bmatrix}$$
    (c) 
$$\begin{bmatrix} 1 & 5 \\ 0 & 2 \\ 0 & 19 \\ 7 & 1 \end{bmatrix}$$

(d) 
$$\begin{bmatrix} 1 & 5 \\ 0 & 2 \\ 0 & 19 \\ 0 & -34 \end{bmatrix}$$
    (e) 
$$\begin{bmatrix} 1 & 5 \\ 0 & 1 \\ 0 & 19 \\ 0 & -34 \end{bmatrix}$$
    (f) 
$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

The matrix is in reduced row-echelon form.

30. (a)

row+(EA1,3,4)

$$\begin{bmatrix} 7 & 1 \\ 0 & 2 \\ -3 & 4 \\ 1 & 5 \end{bmatrix}$$

- (b)

rowSwap(EB1,1,4)

$$\begin{bmatrix} 1 & 5 \\ 0 & 2 \\ 0 & 19 \\ 7 & 1 \end{bmatrix}$$

(c)

\*row+(3,[C],1,3)

$$\begin{bmatrix} 1 & 5 \\ 0 & 2 \\ 0 & 19 \\ 7 & 1 \end{bmatrix}$$

(d)

\*row+(-7,[D],1,4)

$$\begin{bmatrix} 1 & 5 \\ 0 & 2 \\ 0 & 19 \\ 0 & -34 \end{bmatrix}$$

(e)

\*row(.5,[E],2)

$$\begin{bmatrix} 1 & 5 \\ 0 & 1 \\ 0 & 19 \\ 0 & -34 \end{bmatrix}$$

(f)

\*row+(-19,[F],2,3)

$$\begin{bmatrix} 1 & 5 \\ 0 & 1 \\ 0 & 0 \\ 0 & -34 \end{bmatrix}$$

\*row+(34,[G],2,4)

$$\begin{bmatrix} 1 & 5 \\ 0 & 1 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

\*row+(-5,[H],2,1)

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

32. 
$$\begin{bmatrix} 1 & 2 & -1 & 3 \\ 0 & 1 & -2 & 5 \\ 0 & 0 & 1 & -1 \end{bmatrix}$$
    34. 
$$\begin{bmatrix} 1 & -3 & 0 & -7 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

36. 
$$\begin{bmatrix} 1 & 3 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$
    38. 
$$\begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 2 & -6 \end{bmatrix}$$

40. 
$$\begin{cases} x + 5y = 0 \\ y = -1 \end{cases}$$
    42. 
$$\begin{cases} x + 2y - 2z = -1 \\ y + z = 9 \\ z = -3 \end{cases}$$

$(-31, 12, -3)$

44.  $(-2, 4)$     46.  $(3, -1, 0)$     48.  $(-5, 4)$

50. Inconsistent    52.  $(3a + 5, a)$     54.  $(0.2, 0.5)$

56.  $(6, 10, 8)$     58.  $(-\frac{3}{2}a + \frac{3}{2}, \frac{1}{3}a + \frac{1}{3}, a)$     60.  $(-2a, a)$

62.  $(-5a, a, 3)$     64.  $(-2b - 4a + 5, b, 3, a)$

66.  $(-2a, -a, a, a)$     68. No    70. No

72.  $y = -x^2 + 2x + 8$     74.  $y = -\frac{1}{8}x^3 + 2x - 1$

76.  $y = \frac{1}{2}x^4 - x^3 - 2x^2 + 2$

78. \$100,000 at 9%, \$250,000 at 10%, \$150,000 at 12%

80.  $I_1 = \frac{3}{2}, I_2 = \frac{7}{4}, I_3 = \frac{11}{8}$

82.

84.

86.

88.

90.

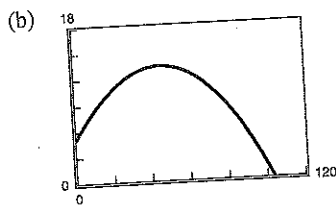
92.

96.

100.

**Section 8.2 (page 577)**

82. (a)  $y = -0.004x^2 + 0.367x + 5$



13 feet, 104 feet

(c) 13.418 feet, 103.793 feet

84. (a)  $x_1 = 500 - s - t$ ,  $x_2 = -200 + s + t$ ,  $x_3 = s$ ,

$x_4 = 350 - t$ ,  $x_5 = t$

(b)  $x_1 = 100$ ,  $x_2 = 200$ ,  $x_3 = 50$ ,  $x_4 = 0$ ,  $x_5 = 350$

(c)  $x_1 = 150$ ,  $x_2 = 150$ ,  $x_3 = 0$ ,  $x_4 = 0$ ,  $x_5 = 350$

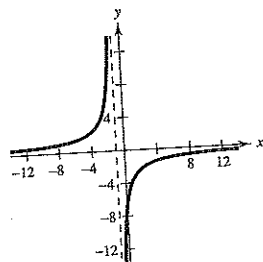
86. False. It is a  $2 \times 4$  matrix.

88. False. Gauss-Jordan elimination reduces a matrix until a reduced row-echelon form is obtained.

90.  $\begin{bmatrix} 1 & 3 & 1 & 3 \\ 0 & 1 & 2 & -1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$ ,  $\begin{bmatrix} 1 & 3 & 1 & 3 \\ 0 & 1 & 7 & -\frac{3}{2} \\ 0 & 0 & 1 & 2 \end{bmatrix}$

(Answers will vary.)

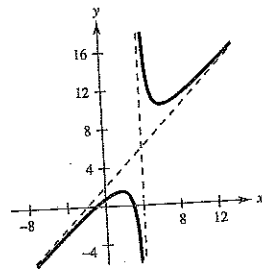
92.



Asymptotes:

$x = -1$ ,  $y = 0$

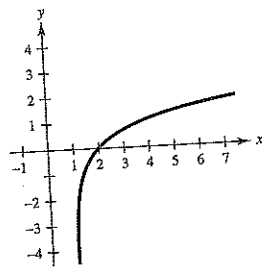
94.



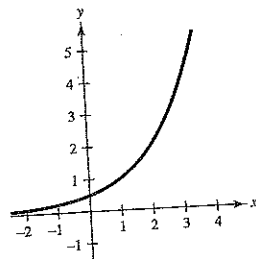
Asymptotes:

$x = 4$ ,  $y = x + 2$

98.



96.



100. (2, -1)    102. (-1, 2, -2)

2.  $x = 13$ ,  $y = 12$     4.  $x = -5$ ,  $y = -4$ ,  $z = 9$

6. (a)  $\begin{bmatrix} -2 & 0 \\ 6 & 3 \end{bmatrix}$     (b)  $\begin{bmatrix} 4 & 4 \\ -2 & -1 \end{bmatrix}$

(c)  $\begin{bmatrix} 3 & 6 \\ 6 & 3 \end{bmatrix}$     (d)  $\begin{bmatrix} 9 & 10 \\ -2 & -1 \end{bmatrix}$

8. (a)  $\begin{bmatrix} 8 & -2 & 3 \\ -5 & 0 & 3 \end{bmatrix}$     (b)  $\begin{bmatrix} -4 & 4 & -1 \\ 3 & -2 & 7 \end{bmatrix}$

(c)  $\begin{bmatrix} 6 & 3 & 3 \\ -3 & -3 & 15 \end{bmatrix}$     (d)  $\begin{bmatrix} -6 & 9 & -1 \\ 5 & -5 & 19 \end{bmatrix}$

10. (a)  $\begin{bmatrix} -4 & 9 & 1 \\ 5 & -6 & -5 \\ 15 & -5 & -2 \\ 3 & 10 & -10 \\ -4 & 0 & -2 \end{bmatrix}$     (b)  $\begin{bmatrix} 2 & -1 & -1 \\ 1 & 2 & 9 \\ -5 & 13 & 0 \\ -3 & 6 & -2 \\ -4 & -2 & 2 \end{bmatrix}$

(c)  $\begin{bmatrix} -3 & 12 & 0 \\ 9 & -6 & 6 \\ 15 & 12 & -3 \\ 0 & 24 & -18 \\ -12 & -3 & 0 \end{bmatrix}$     (d)  $\begin{bmatrix} 3 & 2 & -2 \\ 5 & 2 & 20 \\ -5 & 30 & -1 \\ -6 & 20 & -10 \\ -12 & -5 & 4 \end{bmatrix}$

12. (a) Not possible    (b) Not possible

(c)  $\begin{bmatrix} 9 \\ 6 \\ -3 \end{bmatrix}$     (d) Not possible

14.  $\begin{bmatrix} -7 & 7 \\ 1 & -2 \\ 4 & -5 \\ -5 & 17 \end{bmatrix}$

16. [9.5    2    -7    4.5]

18.  $\begin{bmatrix} -\frac{11}{3} & -\frac{31}{3} \\ 1 & \frac{3}{2} \\ -8 & -1 \end{bmatrix}$

20.  $\begin{bmatrix} -440 & 495 \\ -495 & 1375 \end{bmatrix}$

22.  $\begin{bmatrix} 132 & 168 \\ -108 & 60 \\ -348 & -180 \end{bmatrix}$

24.  $\begin{bmatrix} -2 & -2.5 \\ 0 & 0 \\ 5 & -3.5 \end{bmatrix}$

26.  $\begin{bmatrix} 2 & -5 \\ -5 & 0 \\ 5 & 6 \end{bmatrix}$

28. (a)  $\begin{bmatrix} -7 & 3 \\ -14 & 12 \end{bmatrix}$     (b)  $\begin{bmatrix} -4 & 2 \\ 3 & 9 \end{bmatrix}$     (c)  $\begin{bmatrix} 3 & 2 \\ -2 & 15 \end{bmatrix}$

30. (a)  $\begin{bmatrix} 4 & 2 \\ -2 & 4 \end{bmatrix}$     (b)  $\begin{bmatrix} 4 & 2 \\ -2 & 4 \end{bmatrix}$     (c)  $\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$

32. (a) [12]    (b)  $\begin{bmatrix} 6 & 4 & 2 \\ 9 & 6 & 3 \\ 0 & 0 & 0 \end{bmatrix}$     (c) Not possible