Applied Finite Mathematics, 3rd ed, 2016 Sekhon/Bloom

Chapter 2: Matrices

Answers to Odd Numbered Homework Problems and Answers to all Problems in the Chapter Review Section

2.1 Introduction to Matrices

1). $\begin{bmatrix} 18 & 15 \\ 14 & 13 \\ 12 & 9 \end{bmatrix}$ 3). $\begin{bmatrix} 84 \\ 68 \\ 54 \end{bmatrix}$ 5). $[112.2]$

7) $AB = \begin{bmatrix} 12 & 22 & 19 \\ 10 & 7 & 5 \\ 9 & 15 & 13 \end{bmatrix}$ 9) $AB+BA = \begin{bmatrix} 19 & 35 & 19 \\ 17 & 25 & 20 \\ 20 & 38 & 20 \end{bmatrix}$

11) $2BC = \begin{bmatrix} 10 \\ 30 \\ 16 \end{bmatrix}$ 13) $A^2B = \begin{bmatrix} 105 & 123 & 100 \\ 37 & 52 & 44 \\ 73 & 87 & 71 \end{bmatrix}$

15) $FE = \begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} m & n \\ p & q \end{bmatrix} = \begin{bmatrix} am+bp & an+bq \\ cm+dp & cn+dq \end{bmatrix}$

17) H is 3×1 G is 3×3
HG does not exist because the number of of columns in H does not equal the number of rows in G.

19) $\begin{bmatrix} 1 & -2 & 2 \\ 1 & -3 & 4 \\ 1 & -2 & -3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \\ -12 \end{bmatrix}$

21) $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 1 & -2 & -1 & 0 \\ 0 & 1 & -2 & 4 \\ 1 & 0 & 3 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} 14 \\ -5 \\ 9 \\ 15 \end{bmatrix}$ OR $\begin{bmatrix} 2 & 1 & 2 & 3 \\ 0 & 1 & -2 & -1 \\ 4 & 0 & 1 & -2 \\ 3 & 1 & 0 & 3 \end{bmatrix}\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 14 \\ -5 \\ 9 \\ 15 \end{bmatrix}$

2.2 System of Linear Equations; Gauss-Jordan Method

1). (4, –1)

3). (2, –1, 3)

5). (0.4, 0.3)

7). (4, 3, 2, 1)

2.3 System of Linear Equations; Gauss – Special Cases

1). (4 – 3t, t)

3). Inconsistent system, no solution

5). (3 – 4/7 t, –1 + 16/7 t, t)

7). No, they are not consistent.

11) (5 – 3s + t, s, t)

9) x=6-t y=3 z=t is parametric solution
Answers for specific solutions may vary.
Some possible specific solutions are:

t=0: (6,3,0) t=3: (3,3,3)
t=1: (5,3,1) t=-1: (7,3 -1)
t=2: (4,3,2) t=.5: (5.5, 3, .5)

2.4 Inverse Matrices

3). $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

5). $\begin{bmatrix} 1 & 2 & -1 \\ -1 & -3 & 2 \\ -1 & -1 & 1 \end{bmatrix}$

7). (4, 2)

9). (3, 3, 4)

11). If a matrix M has an inverse, then the system of linear equations that has M as its coefficient matrix has a unique solution. If a system of linear equations has a unique solution, then the number of equations must be the same as the number of variables. Therefore, the matrix that represent its coefficient matrix must be a square matrix.

2.5 Application of Matrices in Cryptography

1). $\begin{bmatrix} 71 \\ 24 \end{bmatrix}\begin{bmatrix} 66 \\ 23 \end{bmatrix}\begin{bmatrix} 78 \\ 35 \end{bmatrix}\begin{bmatrix} 87 \\ 36 \end{bmatrix}\begin{bmatrix} 114 \\ 47 \end{bmatrix}$

3). RETURN HOME

5). $\begin{bmatrix} 12 \\ 51 \\ 9 \end{bmatrix}\begin{bmatrix} 11 \\ 67 \\ 2 \end{bmatrix}\begin{bmatrix} 19 \\ 95 \\ 4 \end{bmatrix}\begin{bmatrix} 14 \\ 105 \\ -11 \end{bmatrix}\begin{bmatrix} 15 \\ 87 \\ -3 \end{bmatrix}\begin{bmatrix} 27 \\ 91 \\ 18 \end{bmatrix}\begin{bmatrix} 4 \\ 67 \\ -23 \end{bmatrix}$

7). HEAD FOR THE HILLS

2.6 Applications – Leontief Models

1). (t, –2t, t)3). Chris = \$1250, Ed = \$1,000

5). $\begin{bmatrix} 315.34 \\ 383.52 \\ 440.34 \end{bmatrix}$

7). Farming = \$201,754.38, Building = \$307,017.54

9). $\begin{bmatrix} 30/100 & 10/120 & 20/110 \\ 20/100 & 30/120 & 20/110 \\ 10/100 & 10/120 & 30/110 \end{bmatrix}$

2.7 Chapter Review

1). a. $\begin{bmatrix} 1000 & 400 & 15 \\ 800 & 500 & 20 \end{bmatrix}$ b. $[30 \quad 50]$

2). a. $\begin{bmatrix} 2 & 1 & 1 \\ 2 & 1 & -1 \end{bmatrix}$ b. $\begin{bmatrix} -3 & -9 & 11 \\ 7 & -14 & 9 \end{bmatrix}$

3). a. $\begin{bmatrix} -2 & 8 & 0 \\ -2 & 4 & 6 \\ -4 & 6 & 6 \end{bmatrix}$ b. $\begin{bmatrix} -5 & 10 & 2 \\ -7 & 4 & 7 \\ -8 & 9 & 7 \end{bmatrix}$

4). a. $\begin{bmatrix} 2 & -2 & 4 \\ 14 & 16 & -22 \\ 8 & 10 & -14 \end{bmatrix}$ b. $\begin{bmatrix} 9 & -3 \\ 6 & -3 \end{bmatrix}$

5). a. $\begin{bmatrix} 2a-2c+6e & 2b-2d+6f \\ 6a+4c+2e & 6b+4d+2f \end{bmatrix}$ b. $\begin{bmatrix} a+3b & -a+2b & 3a+b \\ c+3d & -c+2d & 3c+d \\ e+3f & -e+2f & 3e+f \end{bmatrix}$

6). a. (2, 1, –1) b. (3, 2, 1)

7). Apple = \$.50; banana = \$.30; orange = \$.40

8). a. $x = 6 - t$, $y = 0$, $z = t$; (5, 0, 1) b. no solution

9). $n = 3t - 12$, $d = -4t + 24$, $q = t$; $n = 3$, $d = 4$, $q = 5$

10). a. $x = 4-2t$, $y = t$, $z = 3$; (4, 0, 3) b. $x = 5-4t$, $y = 2-t$, $z = t$; (1, 1, 1)

11). a. $x = .5t$, $y = t$, $z = 2t$; (1, 2, 2) b. no solution

12. a. $\begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}$ b. $\begin{bmatrix} 1 & -2 & 1 \\ -1 & 1 & 0 \\ 1 & 1 & -1 \end{bmatrix}$

13). a. (–1, 4, 2) b. (6, 4, 2, –1)

14). a. $\begin{bmatrix} 22 \\ 33 \\ 1 \end{bmatrix}\begin{bmatrix} 59 \\ 68 \\ 27 \end{bmatrix}\begin{bmatrix} 74 \\ 75 \\ 27 \end{bmatrix}\begin{bmatrix} 22 \\ 49 \\ 4 \end{bmatrix}\begin{bmatrix} 60 \\ 74 \\ 21 \end{bmatrix}$ b. $\begin{bmatrix} 17 \\ 37 \\ 5 \end{bmatrix}\begin{bmatrix} 57 \\ 78 \\ 15 \end{bmatrix}\begin{bmatrix} 74 \\ 91 \\ 27 \end{bmatrix}\begin{bmatrix} 39 \\ 42 \\ 9 \end{bmatrix}\begin{bmatrix} 65 \\ 92 \\ 27 \end{bmatrix}$

15). a. NO PAIN NO GAIN b. GO FOR THE GOLD

16). $x = 40/33\ t$, $y = 36/33\ t$, $z = t$; Chris = 40 hrs, Bob = 36 hrs, Matt = 33 hrs

17). Chris = 34.1 hrs, Bob = 32.2 hrs, Matt = 35.2 hrs