

C: ANSWERS TO SELECTED PROBLEMS

Chapter 6.1, Systems of Linear Equations in Two Variables

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| 1. Yes, it is a solution. | 3. $(3, -2)$. |
| 5. No solutions, inconsistent, independent. | 7. $(\frac{4}{3}, \frac{14}{3})$. |
| 9. $(0, 0)$. | 11. $(-\frac{1}{3}, \frac{1}{2})$. |
| 13. No, it is not a solution. | 15. No solution, inconsistent, independent. |
| 17. No solution, inconsistent, independent. | 19. $(2, 3)$ consistent and independent. |
| 21. $(2, -3)$. | 23. $(1, -2)$. |
| 25. $(-\frac{25}{2}, -\frac{11}{2})$. | 27. $(-3, 0)$. |
| 29. $(-12, -15)$. | |

Chapter 6.2, Matrices and Systems of Linear Equations

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| 1. $2x - 6y = \frac{1}{4}, -3x + y = 8$. | 3. $(-\frac{63}{29}, -\frac{114}{29})$. |
| 5. $(-1, 2, 3)$. | 7. No solution, the system is inconsistent. |
| 9. $(-3, 2)$. | 11. $(7, 3)$. |
| 13. $(\frac{5}{2}, -1)$. | 15. $(-2, -1, 4)$. |
| 17. $x = 2 + 3y, y = \text{any number}$. | 19. No solution. |
| 21. $(4, \frac{1}{2}, -\frac{1}{2})$. | 23. No solution. |
| 25. $w = 19 - 2y - 16z, x = -6 + 3y + 4z, y = \text{any number}, z = \text{any number}$. | |
| 27. $x = -1 + 4z, y = 4 + 2z, z = \text{any number}$. | |
| 29. $v = 6 - 8x + 3y, w = 4 - 4x - 2y, x = \text{any number}, y = \text{any number}, z = -5$. | |

Chapter 6.3, Matrix Notation, Algebra, and Inverses

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| 1. A $2 \times 2, B$ $2 \times 5, C$ $3 \times 1, D$ $1 \times 2, E$ 2×2 . | 3. $a_{22} = 9, b_{12} = 12, b_{23} = -1, c_{11} = 2, d_{12} = 3$. |
| 5. $I' = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, J' = \begin{bmatrix} 3 & 4 & -8 \\ -1 & 9 & 7 \\ 2 & -5 & 6 \end{bmatrix}, K' = \begin{bmatrix} 1 & 3 & 3 \\ 2 & 1 & 3 \\ 2 & 2 & 1 \end{bmatrix}$. | |
| 7. $X' = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$. | 9. $\begin{bmatrix} 5a + 1c & 5b + 1d \\ 2a - 3c & 2b - 3d \end{bmatrix}$. |
| 11. $\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix}$. | 13. $A^{-1} = \begin{bmatrix} -\frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ 1 & 0 & -1 \\ \frac{3}{2} & -\frac{1}{2} & -\frac{1}{2} \end{bmatrix}$. |
| 15. [a] $E, [b] \begin{bmatrix} 9 & 9 \\ -3 & -3 \end{bmatrix}, [c] \begin{bmatrix} 11 & 13 \\ 5 & 3 \end{bmatrix}$. | 17. [a] Not possible. [b] $A, [c] \begin{bmatrix} -1 & -3 \\ -7 & -5 \end{bmatrix}$. |
| 19. [a] $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}, [b] \begin{bmatrix} -1 & 3 \\ -2 & 2 \\ -3 & 1 \end{bmatrix}, [c] \begin{bmatrix} -1 & 4 \\ 6 & 2 \\ -7 & 0 \end{bmatrix}$. | 21. $AB = [-10]$ or $-10; BA = \begin{bmatrix} -6 & 3 \\ 8 & -4 \end{bmatrix}$. |
| 23. $AB = \begin{bmatrix} 7 & -6 & 1 \\ -15 & 12 & 3 \\ -2 & -1 & 8 \end{bmatrix}, BA = \begin{bmatrix} 9 & 11 & -10 \\ 3 & 4 & -4 \\ -3 & -1 & 14 \end{bmatrix}$. | 25. $AB = [35 \ -35], BA$ is not possible |
| 27. $\begin{bmatrix} 5 & 7 \\ 6 & -1 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} -4 \\ 3 \end{bmatrix}$. | 29. [a] $\begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix}, [b] \begin{bmatrix} 2 & -3 \\ -7 & 11 \end{bmatrix}, [c] \begin{bmatrix} \frac{3}{8} & -\frac{1}{4} & \frac{1}{8} \\ -\frac{1}{8} & \frac{3}{4} & -\frac{3}{8} \\ -\frac{1}{4} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}$. |
| 31. $(-23, 83)$. | 33. $(\frac{1}{11}, -\frac{6}{11})$. |

35. $(\frac{340}{203}, \frac{317}{203}, -\frac{234}{203}, -\frac{282}{203})$.

Chapter 6.4, The Leontief Input-Output Model

1. [a] $A = \begin{bmatrix} 0.25 & 0.6 \\ 0.7 & 0.4 \end{bmatrix} = \frac{1}{20} \begin{bmatrix} 5 & 12 \\ 14 & 8 \end{bmatrix}$, [b] $D = [150 \ 70]^t$, [c] $\frac{5}{3} \begin{bmatrix} 12 & 12 \\ 14 & 15 \end{bmatrix}$, [d] $D = [4400 \ 5250]^t$.
3. [a] $A = \begin{bmatrix} 0.2 & 0.5 \\ 0.25 & 0.2 \end{bmatrix} = \frac{1}{100} \begin{bmatrix} 20 & 50 \\ 25 & 20 \end{bmatrix}$, [b] $[5 \ 3]$, [c] $\frac{10}{103} \begin{bmatrix} 16 & 10 \\ 5 & 16 \end{bmatrix}$, [d] $D = [530 \ 106]^t$,
 [e] $X = [926.2 \ 421.9]^t$, [f] 5896.9 work-days.
5. [a] $A = \begin{bmatrix} 0.2 & 0.1 & 0.5 \\ 0 & 0.1 & 0 \\ 0.2 & 0.2 & 0.3 \end{bmatrix}$, [b] $[0.4 \ 0.2 \ 0.3]$, [c] $\frac{5}{207} \begin{bmatrix} 63 & 17 & 45 \\ 0 & 46 & 0 \\ 18 & 18 & 72 \end{bmatrix}$, [d] $D = [1 \ 1 \ 1]^t$,
 [e] $X = [3.019 \ 1.111 \ 2.6091]^t$, [f] 2.213 K\$.
7. [a] $\frac{5}{16} \begin{bmatrix} 5 & 2 \\ 2 & 4 \end{bmatrix}$; $X = [144.4 \ 113.8]^t$; $x_0 = 122.98$.
9. [a] $\frac{5}{27} \begin{bmatrix} 7 & 1 & 2 \\ 2 & 8 & 16 \\ 7 & 1 & 56 \end{bmatrix}$; $X = [142.2 \ 657.8 \ 1822.2]^t$; $x_0 = 488$.

Chapter 6.5, Chapter Review

1. $(-4, -8)$; Consistent; Independent. 3. No solution.
 5. $(0, 0, 0)$; Consistent; Independent. 7. \$1600 at 10%, \$3400 at 10.5%.
 9. 74.5, 68.5, 82. 11. $(1, 2)$.
 13. $x = \frac{5}{2}$, $y = -\frac{5}{2}$, $z =$ any real number; $(0, 0, 0)$, $(2, -2, 4)$, $(1, -1, 2)$.
15. $\begin{bmatrix} 0 & -1 & 6 \\ 3 & 1 & -2 \\ -2 & 1 & -2 \end{bmatrix}$. 17. $\begin{bmatrix} -1 & 1 & 0 \\ -2 & -3 & 2 \\ 2 & 0 & -1 \end{bmatrix}$.
19. Not possible. 21. $\begin{bmatrix} -1 & 1 & 0 \\ 0 & -2 & 1 \\ 6 & 0 & -3 \end{bmatrix}$.
23. $\begin{bmatrix} -\frac{1}{6} & 0 \\ \frac{1}{6} & \frac{1}{3} \end{bmatrix}$. 25. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1}{9} & \frac{5}{18} & 0 \\ 0 & -\frac{1}{9} & \frac{2}{9} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$.
27. $\begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = [-29 \ 2]$; $A^{-1} = \begin{bmatrix} \frac{3}{17} & \frac{1}{17} \\ -\frac{2}{17} & \frac{5}{17} \end{bmatrix}$; $(-5, 4)$.
29. \$10,000 at 12%, \$12,000 at 13%, \$18,000 at 14.5%.