

Answer Key

Chapter 4 Test (pages 20A–20B)

1. $\begin{bmatrix} 5 & 7 & 3 \\ 1 & -5 & 5 \end{bmatrix}$ 2. $\begin{bmatrix} 2 & 5 & -3 \\ -2 & -1 & 9 \end{bmatrix}$

3. $-4\left(\begin{bmatrix} -3 & 2 \\ -1 & 2 \end{bmatrix}\right) = \begin{bmatrix} 12 & -8 \\ 4 & -8 \end{bmatrix}$ 4. $\begin{bmatrix} 18 \\ 0 \\ -2 \end{bmatrix}$

5. $\begin{bmatrix} -23 & 4 \\ 17 & 8 \end{bmatrix}$ 6. $\begin{bmatrix} 4 & 6 & 0 \\ -5 & -2 & 1 \\ 7 & 12 & -1 \end{bmatrix}$

7. $y + 6 = 8$ $x - 4 = -9$

$y = 2$ $x = -5$

$(-5, 2)$

8. $-22 = 2x$ 9. $3x = -15$ $24 = y$

$-11 = x$ $x = -5$ $y = 24$

$(-11, -4)$ $(-5, 24)$

10. $\det A = 28 - (27) = 1$ 11. $2 + 1 = 3$

12. $(0 + 0 + 2) - (10 + 24 + 0) = -32$

13. $(0 + 0 - 120) - (0 - 10 + 18) = -128$

14. $A = -\frac{1}{2} \begin{vmatrix} 2 & 1 & 1 \\ 5 & 3 & 1 \\ 7 & 1 & 1 \end{vmatrix}$

$= -\frac{1}{2}[(6 + 7 + 5) - (21 + 2 + 5)] = 5$

15. $A = -\frac{1}{2} \begin{vmatrix} -1 & 0 & 1 \\ -3 & 3 & 1 \\ 0 & 4 & 1 \end{vmatrix}$

$= -\frac{1}{2}[(-3 + 0 - 12) - (0 - 4 + 0)] = \frac{11}{2}$

16. $A = -\frac{1}{2} \begin{vmatrix} -3 & 2 & 1 \\ -1 & 4 & 1 \\ -4 & 3 & 1 \end{vmatrix}$

$= -\frac{1}{2}[(-12 - 8 - 3) - (-16 - 9 - 2)] = 2$

17. $A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$ $\det A = 6 - 5 = 1$

$x = \frac{\begin{vmatrix} 12 & 1 \\ 27 & 3 \end{vmatrix}}{1} = 36 - 27 = 9$

$y = \frac{\begin{vmatrix} 2 & 12 \\ 5 & 27 \end{vmatrix}}{1} = 54 - 60 = -6$

$(9, -6)$

18. $A = \begin{bmatrix} -4 & 5 \\ 5 & -6 \end{bmatrix}$ $\det A = 24 - 25 = -1$

$x = \frac{\begin{vmatrix} -10 & 5 \\ 13 & -6 \end{vmatrix}}{-1} = -(-60 - 65) = 5$

$y = \frac{\begin{vmatrix} -4 & -10 \\ 5 & 13 \end{vmatrix}}{-1} = -(-52 + 50) = 2$

$(5, 2)$

19. $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & -1 \\ -1 & -1 & 1 \end{bmatrix}$

$\det A = (2 + 1 + 0) - (0 + 1 - 0) = 2$

$x = \frac{\begin{vmatrix} 2 & 1 & 0 \\ 0 & 2 & -1 \\ -1 & -1 & 1 \end{vmatrix}}{2} = \frac{(4 - 1 + 0) - (-2 + 2 + 0)}{2} = \frac{3}{2}$

$y = \frac{\begin{vmatrix} 1 & 2 & 0 \\ 0 & 0 & -1 \\ -1 & -1 & 1 \end{vmatrix}}{2} = \frac{(0 + 2 + 0) - (0 + 1 + 0)}{2} = \frac{1}{2}$

$z = \frac{\begin{vmatrix} 1 & 1 & 2 \\ 0 & 2 & 0 \\ -1 & -1 & -1 \end{vmatrix}}{2} = \frac{(-2 + 0 + 0) - (-4 + 0 + 0)}{2}$

$= 1$

$\left(\frac{3}{2}, \frac{1}{2}, 1\right)$

Answer Key

20. $A = \begin{bmatrix} 5 & -2 & 7 \\ 2 & 5 & 3 \\ 3 & -1 & 4 \end{bmatrix}$
 $\det A = (100 - 18 - 14) - (105 - 15 - 16)$
 $= 68 - 74 = -6$
 $x = \frac{\begin{vmatrix} 12 & -2 & 7 \\ 10 & 5 & 3 \\ 8 & -1 & 4 \end{vmatrix}}{-6}$
 $= \frac{(240 - 48 - 70) - (280 - 36 - 80)}{-6}$
 $= \frac{122 - 164}{-6} = 7$
 $y = \frac{\begin{vmatrix} 5 & 12 & 7 \\ 2 & 10 & 3 \\ 3 & 8 & 4 \end{vmatrix}}{-6}$
 $= \frac{(200 + 108 + 112) - (210 + 120 + 96)}{-6}$
 $= \frac{420 - 426}{-6} = 1$
 $z = \frac{\begin{vmatrix} 5 & -2 & 12 \\ 2 & 5 & 10 \\ 3 & -1 & 8 \end{vmatrix}}{-6}$
 $= (200 - 60 - 24) - (180 - 50 - 32) = \frac{116 - 98}{-6} = -3$
 (7, 1, -3)

21. $\frac{1}{36 - 15} \begin{bmatrix} 9 & -5 \\ -3 & 4 \end{bmatrix} = \begin{bmatrix} \frac{3}{7} & -\frac{5}{21} \\ -\frac{1}{7} & \frac{4}{21} \end{bmatrix}$

22. $\frac{1}{-1 + 2} \begin{bmatrix} 1 & 2 \\ -1 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -1 & -1 \end{bmatrix}$

23. $\frac{1}{30 - 24} \begin{bmatrix} -5 & -4 \\ -6 & -6 \end{bmatrix} = \begin{bmatrix} -\frac{5}{6} & -\frac{2}{3} \\ -1 & -1 \end{bmatrix}$

24. $\frac{1}{-5 + 0} \begin{bmatrix} -5 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & -\frac{1}{5} \end{bmatrix}$

25. $A = \begin{bmatrix} 8 & 7 \\ 1 & 1 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} 1 & -7 \\ -1 & 8 \end{bmatrix}$
 $x = \begin{bmatrix} 1 & -7 \\ -1 & 8 \end{bmatrix} \begin{bmatrix} 3 & -6 \\ -2 & 9 \end{bmatrix} = \begin{bmatrix} 17 & -69 \\ -19 & 78 \end{bmatrix}$

26. $A = \begin{bmatrix} 2 & 5 \\ 2 & 6 \end{bmatrix} \quad A^{-1} = \frac{1}{12 - 10} \begin{bmatrix} 6 & -5 \\ -2 & 2 \end{bmatrix}$
 $x = \frac{1}{2} \begin{bmatrix} 6 & -5 \\ -2 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 6 & -5 \\ -2 & 2 \end{bmatrix} = \begin{bmatrix} 3 & -\frac{5}{2} \\ -1 & 1 \end{bmatrix}$

27. $A = \begin{bmatrix} 1 & 0 \\ -6 & 2 \end{bmatrix} \quad A^{-1} = \frac{1}{2} \begin{bmatrix} 2 & 0 \\ 6 & 1 \end{bmatrix}$
 $x = \begin{bmatrix} 1 & 0 \\ 3 & \frac{1}{2} \end{bmatrix} \begin{bmatrix} 10 & 6 & 8 \\ 4 & 12 & 2 \end{bmatrix} = \begin{bmatrix} 10 & 6 & 8 \\ 32 & 24 & 25 \end{bmatrix}$

28. $A = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$
 $x = \begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 5 \\ -9 \end{bmatrix} = \begin{bmatrix} 6 \\ 1 \end{bmatrix}$
 (6, 1)

29. $A = \begin{bmatrix} 3 & 2 \\ -2 & 5 \end{bmatrix} \quad A^{-1} = \frac{1}{19} \begin{bmatrix} 5 & -2 \\ 2 & 3 \end{bmatrix}$
 $x = \frac{1}{19} \begin{bmatrix} 5 & -2 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} -8 \\ 18 \end{bmatrix} = \frac{1}{19} \begin{bmatrix} -76 \\ 38 \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \end{bmatrix}$
 (-4, 2)

30. $A = \begin{bmatrix} 2 & -7 \\ -3 & 11 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} 11 & 7 \\ 3 & 2 \end{bmatrix}$
 $x = \begin{bmatrix} 11 & 7 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} 6 \\ -10 \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \end{bmatrix}$
 (-4, -2)

31. $A = -\frac{1}{2} \begin{vmatrix} 1 & 7 & 1 \\ 4 & 5 & 1 \\ 2 & 2 & 1 \end{vmatrix}$
 $= -\frac{1}{2} [(5 + 14 + 8) - (10 + 2 + 28)]$
 $= -\frac{1}{2} [27 - 40] = \frac{13}{2}$

32. $A = \begin{bmatrix} 2 & -1 \\ 3 & -1 \end{bmatrix} \quad A^{-1} = \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix}$
 $[44 \ -15] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [1 \ 14] \quad \text{AN}$
 $[3 \ -1] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [0 \ 1] \quad \text{—A}$
 $[80 \ -32] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [16 \ 16] \quad \text{PP}$
 $[39 \ -17] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [12 \ 5] \quad \text{LE}$
 $[3 \ -1] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [0 \ 1] \quad \text{—A}$
 $[12 \ -4] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [0 \ 4] \quad \text{—D}$
 $[77 \ -26] \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix} = [1 \ 25] \quad \text{AY}$
 AN APPLE A DAY

33. $x + y = 5 \quad A = \begin{bmatrix} 1 & 1 \\ 1.5 & 5 \end{bmatrix} \quad \det A = 5 - 1.5 = 3.5$
 $1.5x + 5y = 18$
 $x = \frac{\begin{vmatrix} 5 & 1 \\ 18 & 5 \end{vmatrix}}{3.5} = \frac{25 - 18}{3.5} = \frac{7}{3.5} = 2$
 $y = \frac{\begin{vmatrix} 1 & 5 \\ 1.5 & 18 \end{vmatrix}}{3.5} = \frac{18 - 7.5}{3.5} = \frac{10.5}{3.5} = 3$
 You should make your lunch 2 times and buy your lunch 3 times a week.