

7.

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \\ 0 \\ 8 \\ 0 \\ 9 \\ 0 \end{pmatrix} + \alpha \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \gamma \begin{pmatrix} 0 \\ -3 \\ 0 \\ -5 \\ 1 \\ 0 \\ 0 \end{pmatrix} + \delta \begin{pmatrix} 0 \\ -7 \\ 0 \\ -6 \\ 0 \\ -4 \\ 1 \end{pmatrix} .$$

#### A.4 Chapter 4

 1. a) 14 b)  $-1$  c)  $\ln(4/27)$  d) 1 e)  $\tan^2 x$  f) 17 .

 2. a) 90 b) 0 c)  $-5$  d)  $-24$  e)  $-1$  f) 10 .

 3. a)  $-1/2$  b)  $1, -3$  c)  $0, 2, 3$  d)  $1, 2, -2$  .

4. a) Hint: expand the determinant along the bottom row.

b) Hint: Use the fact stated in (4.19).

 c)  $2x + 3y = 1$  .

 5.  $A = 1/2$  .

 6.  $V = 1$  .

7. Hint: Use Theorem 4.3.

 8. a)  $\begin{matrix} x = 1 \\ y = 2 \end{matrix}$  b)  $\begin{matrix} x = \frac{1}{2} \\ y = \frac{1}{3} \end{matrix}$  c)  $\begin{matrix} x = -3 \\ y = -1 \end{matrix}$  d)  $\begin{matrix} x = 0 \\ y = -1 \end{matrix}$  .

9. 4.

 10. 35 and  $-35$ .

 11. a)  $-13$  b)  $-4$  c) 0 d)  $-6$  e) 12 f)  $-2$  .

#### A.5 Chapter 5

1. Inverses exist only for matrices in parts b), d), f), g), j), l), and m) .

$$2. \quad \text{b)} \begin{pmatrix} \frac{1}{2} \\ \end{pmatrix} \quad \text{d)} \frac{1}{3} \begin{pmatrix} -1 & 2 \\ 2 & -1 \end{pmatrix} \quad \text{f)} \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

$$\text{g)} \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \quad \text{j)} \frac{1}{4} \begin{pmatrix} 3 & -1 & 1 \\ 1 & 1 & 3 \\ 1 & 1 & -1 \end{pmatrix} \quad \text{l)} \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \quad \text{m)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

3. Yes.

$$4. \quad ad - bc \neq 0, \quad A^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}.$$

$$5. \quad abc \neq 0, \quad A^{-1} = \begin{pmatrix} \frac{1}{a} & 0 & 0 \\ 0 & \frac{1}{b} & 0 \\ 0 & 0 & \frac{1}{c} \end{pmatrix}.$$

$$6. \quad \text{a)} \begin{pmatrix} 0 \\ -1 \\ 1 \end{pmatrix} \quad \text{b)} \begin{pmatrix} 5 \\ -2 \\ -6 \end{pmatrix} \quad \text{c)} \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \quad \text{d)} \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \quad \text{e)} \begin{pmatrix} 13 \\ -10 \\ -11 \end{pmatrix}.$$

7.  $x = 13$ ,  $y = -10$ , and  $z = -11$ .

$$8. \quad A^{-1} = \begin{pmatrix} 0 & -1 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & -1 \end{pmatrix}.$$

$$9. \quad A^{-1} = \begin{pmatrix} \cos \beta & \sin \beta \\ -\sin \beta & \cos \beta \end{pmatrix}, \quad A^{-1} = A^T \quad \& \quad A^{-1}(\beta) = A(-\beta).$$

$$10. \quad \text{a)} \text{ Division by zero would occur.} \quad \text{b)} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} + \alpha \begin{pmatrix} -1 \\ 1 \end{pmatrix}.$$

$$11. \quad \text{a)} \quad P = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ \beta & 0 & 1 \end{pmatrix}$$

$$\text{b)} \quad P = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}$$

$$\text{c)} \quad P = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \alpha & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}.$$

$$12. \text{ a) } P = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -\beta & 0 & 1 \end{pmatrix}$$

$$\text{ b) } P = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}$$

$$\text{ c) } P = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{1}{\alpha} & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$13. \text{ a) } A = \begin{pmatrix} 7 & 2 \\ 3 & 1 \end{pmatrix}, \quad A^{-1} = \begin{pmatrix} 1 & -2 \\ -3 & 7 \end{pmatrix}$$

$$\text{ b) } A = \begin{pmatrix} 1 & 3 & 0 \\ 0 & 1 & 0 \\ 0 & 2 & 1 \end{pmatrix}, \quad A^{-1} = \begin{pmatrix} 1 & -3 & 0 \\ 0 & 1 & 0 \\ 0 & -2 & 1 \end{pmatrix}$$

$$\text{ c) } A = \begin{pmatrix} 0 & 1 & 4 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \quad A^{-1} = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & -4 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\text{ d) } A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 15 & 1 & 3 & 0 \\ 5 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \quad \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & -3 & 0 \\ -5 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$14. \text{ a) } \begin{pmatrix} 7 & 0 \\ 0 & 2 \end{pmatrix} \quad \text{ b) } \begin{pmatrix} 0 & -2 \\ -3 & 0 \end{pmatrix} \quad \text{ c) } \begin{pmatrix} 7 & -3 \\ 5 & 0 \end{pmatrix} \quad \text{ d) } \begin{pmatrix} 7 & -3 \\ 5 & 2 \end{pmatrix}$$

$$\text{ e) } \begin{pmatrix} 1 & 5 & 2 \\ 2 & -7 & 4 \\ 7 & 1 & -3 \end{pmatrix} \quad \text{ f) } \begin{pmatrix} -2 & 0 & 2 \\ 0 & 0 & -1 \\ -2 & -2 & 2 \end{pmatrix} \quad \text{ g) } \begin{pmatrix} 2 & 0 & 0 \\ 0 & 8 & -10 \\ 0 & -4 & 6 \end{pmatrix}$$

$$16. \text{ a) } \begin{pmatrix} -1 \\ 2 \end{pmatrix} \quad \text{ b) } \begin{pmatrix} 1 & 2 \\ 1 & -2 \\ -4 & 5 \end{pmatrix} \quad \text{ c) } \begin{pmatrix} 3 & 7 & -3 & 5 \\ -3 & -1 & 6 & 1 \\ 6 & -7 & 9 & 1 \end{pmatrix}$$

$$\text{ d) } \begin{pmatrix} 1 \\ -7 \\ 1 \\ 1 \end{pmatrix}$$