MA 351 Additional Solutions

14, p. 17 No,

15, p. 17 No,

16, p. 17 Yes: e.g. $aX + bY$ where $4a > b > 0$.

7, p. 36
$$\begin{bmatrix} 11 - s, & -6 + s, & 2 - s, & s \end{bmatrix}^t$$

8, p. 36   a
$$\begin{bmatrix} 1 & -3 & 0 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

e
$$\begin{bmatrix} 1 & 0 & \frac{9}{10} & 3/2 \\ 0 & 1 & -1/10 & -1/2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

f
$$\begin{bmatrix} 1 & 0 & 0 & \frac{6}{25} \\ 0 & 1 & 0 & -\frac{9}{25} \\ 0 & 0 & 1 & 7/5 \end{bmatrix}$$

g
$$\begin{bmatrix} 1 & 0 & 3/4 & 1 & 0 \\ 0 & 1 & 1/4 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Prob. 2, p.59   a

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

c

$$\begin{bmatrix} 3 & 1 & 2 & 6 & 0 \\ 0 & 2/3 & 1/3 & -1 & 1 \\ 0 & 0 & 2 & 4 & 1 \\ 0 & 0 & 0 & -5/2 & -5/4 \end{bmatrix}$$

Prob. 3, p.59   b

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

d

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

j

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

p. 60, 5b $[[x = 1/10\,c - 1/5\,a - 1/2\,b, y = 1/28\,c + 1/7\,a - \frac{13}{28}\,b, z = \frac{2}{35}\,c + 1/35\,a - 1/7\,b]]$

2

p. 60, 7

$$\begin{bmatrix} 2 & 4 & 1 & 3 & a \\ 0 & 7 & 7/2 & 5/2 & b + 3/2\,a \\ 0 & 0 & 0 & 0 & 3\,b + c - 2\,a \\ 0 & 0 & 0 & 0 & d - 3a + 2b \end{bmatrix}$$

p. 61, 10   a

$$\begin{bmatrix} 1 & 0 & -1 & 0 & 5 \\ 0 & 1 & 2 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

b

$$\begin{bmatrix} 1 & 0 & 1/2 & 0 & 2 \\ 0 & 1 & 1/2 & 0 & -3 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

p. 82,4   a

$$\text{span} \left\{ \begin{bmatrix} 4/7 \\ 3/2 \\ 6/7 \\ 1 \end{bmatrix} \right\}$$

b span $\{[\mathbf{0}]\}$

c

$$\text{span} \left\{ \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix} \right\}$$

13, a

$$
\begin{bmatrix} 1 \\ 0 \\ 2 \\ 0 \\ 0 \\ 1 \end{bmatrix} + s_2 \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} + s_4 \begin{bmatrix} -2 \\ 0 \\ -1 \\ 1 \\ 0 \\ 0 \end{bmatrix} + s_5 \begin{bmatrix} -1 \\ 0 \\ 1 \\ 0 \\ 1 \\ 0 \end{bmatrix}
$$

13, b Same as (a) without the translation vector.

p. 107, 1   c

$$
A = \begin{bmatrix} 1 & 3 & 7 \\ 2 & -1 & -7 \\ 1 & 2 & 4 \end{bmatrix} \qquad R = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{bmatrix}
$$

e

$$
A = \begin{bmatrix} 2 & 4 & 8 \\ 3 & 2 & 4 \\ 0 & 1 & 2 \\ -2 & -1 & -2 \\ -1 & 3 & 6 \\ 2 & 0 & 0 \end{bmatrix} \qquad R = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}
$$

f

$$
A = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 4 & 3 & 2 & 6 \\ 1 & 1 & 1 & 1 \\ 3 & 0 & -1 & 5 \end{bmatrix} \qquad R = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}
$$

i Independent

4

k

$$A = \begin{bmatrix} 3 & -4 & 2 \\ 2 & -3 & -3 \\ 4 & -5 & 7 \\ 5 & -6 & 12 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 18 \\ 0 & 1 & 13 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

p. 107, 3   a

$$A = \begin{bmatrix} 1 & 2 & -3 & 3 \\ 2 & 1 & 3 & 4 \\ -8 & -1 & -21 & -14 \\ 4 & -1 & 15 & 6 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 3 & 5/3 \\ 0 & 1 & -3 & 2/3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

b

$$A = \begin{bmatrix} 1 & 2 & -8 & 4 \\ 2 & 1 & -1 & -1 \\ -3 & 3 & -21 & 15 \\ 3 & 4 & -14 & 6 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 2 & -2 \\ 0 & 1 & -5 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

c

$$A = \begin{bmatrix} 2 & -1 & 2 \\ 3 & 0 & -1 \\ -1 & 2 & -5 \\ 19 & -8 & 15 \\ 2 & 5 & -14 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & -1/3 \\ 0 & 1 & -8/3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

d

$$A = \begin{bmatrix} 2 & 3 & -1 & 19 & 2 \\ -1 & 0 & 2 & -8 & 5 \\ 2 & -1 & -5 & 15 & -14 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & -2 & 8 & -5 \\ 0 & 1 & 1 & 1 & 4 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

5

f

$$A = \begin{bmatrix} 3 & 1 & 2 & -7 \\ 2 & 4 & 0 & 8 \\ -1 & -2 & -1 & -2 \\ 2 & 2 & -3 & 8 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

4, p. 108

$$A^t = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 3 & 1 \\ 1 & 3 & 6 & 5 \\ 1 & 0 & -3 & 2 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & -3 & 2 \\ 0 & 1 & 3 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

5, p. 108

$$A = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 2 & 1 & 3 & 0 \\ 3 & 3 & 6 & -3 \\ 4 & 1 & 5 & 2 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

20b, p. 123

$$A = \begin{bmatrix} 1 & 3 & 1 & 1 \\ 2 & 1 & 2 & 1 \\ 4 & 7 & 4 & 3 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 1 & 2/5 \\ 0 & 1 & 0 & 1/5 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

20b, p. 123

$$A = \begin{bmatrix} 1 & -5 & 3 & 4 \\ 2 & -10 & 6 & 8 \\ 3 & -15 & 9 & 12 \end{bmatrix} \quad R = \begin{bmatrix} 1 & -5 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

21, p. 123

$$A = \begin{bmatrix} 2 & 1 & 7 \\ -3 & 2 & -2 \\ 1 & 3 & 4 \end{bmatrix} \quad R = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$