2.1

2. $\mathbf{A} = \begin{bmatrix} E & R & S & T & A \\ N & P & O & C & W \\ H & B & U & I & L \\ M & G & Y & F & K \end{bmatrix}$

   (a) $a_{31}, a_{11}, a_{35}, a_{22}$
   HELU

   (b) $a_{35}, a_{34}, a_{21}, a_{11}, a_{15}, a_{15}$
   LINEAR

   (c) $a_{11}, a_{35}, a_{32}, a_{23}, a_{25}$
   ELBOW

   (d) $a_{25}, a_{15}, a_{14}, a_{24}, a_{31}, a_{23}, a_{33}, a_{14}$
   WATCHOUT

12. $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 5 & 7 & 9 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} -1 & 0 & 2 & 1 \\ 2 & -1 & -1 & 0 \\ 2 & 0 & 0 & 2 \end{bmatrix}$

   (b) $2\mathbf{B} = \begin{bmatrix} -2 & 0 & 4 & 2 \\ 4 & -2 & -2 & 0 \\ 4 & 0 & 0 & 4 \end{bmatrix}$

   (d) $\mathbf{A} + \mathbf{B} = \begin{bmatrix} 0 & 2 & 5 & 5 \\ 4 & 3 & 5 & 8 \\ 5 & 5 & 7 & 11 \end{bmatrix}$

2.2

10.

$$\begin{aligned} 2x_1 + 3x_2 - 2x_3 &= 5y_1 + 2y_2 - 3y_3 + 200 \\ x_1 + 4x_2 + 3x_3 &= 6y_1 - 4y_2 + 4y_3 - 120 \\ 5x_1 + 2x_2 - x_3 &= 2y_1 - 2y_3 + 350 \end{aligned}$$

   (a) $\mathbf{A} = \begin{bmatrix} 2 & 3 & -2 \\ 1 & 4 & 3 \\ 5 & 2 & -1 \end{bmatrix}$, $\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

   $\mathbf{B} = \begin{bmatrix} 5 & 2 & -3 & 200 \\ 6 & -4 & 4 & -120 \\ 2 & 0 & -2 & 350 \end{bmatrix}$, $\mathbf{y} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ 1 \end{bmatrix}$

   $\mathbf{Ax} = \mathbf{By}$

   (b) $\mathbf{A} = \begin{bmatrix} 2 & 3 & -2 & -5 & -2 & 3 \\ 1 & 4 & 3 & -6 & 4 & -4 \\ 5 & 2 & -1 & -2 & 0 & 2 \end{bmatrix}$, $\mathbf{n} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ y_1 \\ y_2 \\ y_3 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 200 \\ -120 \\ 350 \end{bmatrix}$

   $\mathbf{An} = \mathbf{b}$

18. $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 7 & 9 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 1 & 0 & -1 \\ 2 & -2 & 0 \\ 0 & 1 & -1 \end{bmatrix}$, $\mathbf{C} = \begin{bmatrix} 5 & 4 & 1 \\ 1 & 0 & 2 \\ 3 & 2 & 1 \\ 0 & 1 & 3 \end{bmatrix}$

   (a) $\mathbf{AB}$ does not exist.

(b) $\mathbf{BA} = \begin{bmatrix} -2 & -4 & -4 & -5 \\ -2 & -4 & -6 & -8 \\ -1 & -2 & -1 & -1 \end{bmatrix}$

(c) $\mathbf{AC} = \begin{bmatrix} 16 & 14 & 20 \\ 32 & 28 & 40 \\ 42 & 35 & 49 \end{bmatrix}$

(d) $\mathbf{CA} = \begin{bmatrix} 16 & 32 & 46 & 61 \\ 7 & 14 & 17 & 22 \\ 10 & 20 & 28 & 37 \\ 11 & 22 & 27 & 35 \end{bmatrix}$

(e) $\mathbf{CB} = \begin{bmatrix} 13 & -7 & -6 \\ 1 & 2 & -3 \\ 7 & -3 & -4 \\ 2 & 1 & -3 \end{bmatrix}$

22. $\begin{array}{l} \\ \text{Apple} \\ \text{Orange} \\ \text{Pear} \end{array} \begin{array}{c} \begin{array}{cc} \text{Store } A & \text{Store } B \end{array} \\ \begin{bmatrix} .10 & .15 \\ .15 & .20 \\ .10 & .10 \end{bmatrix} \end{array} \quad \begin{array}{l} \\ \text{Person } A \\ \text{Person } B \end{array} \begin{array}{c} \begin{array}{ccc} \text{Apple} & \text{Orange} & \text{Pear} \end{array} \\ \begin{bmatrix} 5 & 10 & 3 \\ 4 & 5 & 5 \end{bmatrix} \end{array}$

$\begin{array}{l} \\ \text{Town 2} \\ \text{Town 1} \end{array} \begin{array}{c} \begin{array}{cc} \text{Person } A & \text{Person } B \end{array} \\ \begin{bmatrix} 1000 & 500 \\ 2000 & 1000 \end{bmatrix} \end{array}$

(a) $\begin{bmatrix} 5 & 10 & 3 \\ 4 & 5 & 5 \end{bmatrix} \begin{bmatrix} .10 & .15 \\ .15 & .20 \\ .10 & .10 \end{bmatrix} = \begin{array}{l} \\ \text{Person } A \\ \text{Person } B \end{array} \begin{array}{c} \begin{array}{cc} \text{Store } A & \text{Store } B \end{array} \\ \begin{bmatrix} 2.30 & 3.05 \\ 1.65 & 2.10 \end{bmatrix} \end{array}$

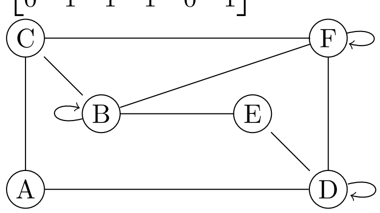
(b) $\begin{bmatrix} 1000 & 500 \\ 2000 & 1000 \end{bmatrix} \begin{bmatrix} 5 & 10 & 3 \\ 4 & 5 & 5 \end{bmatrix} = \begin{array}{l} \\ \text{Town 1} \\ \text{Town 2} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Apple} & \text{Orange} & \text{Pear} \end{array} \\ \begin{bmatrix} 7000 & 12500 & 5500 \\ 14000 & 25000 & 11000 \end{bmatrix} \end{array}$

(c) $\begin{bmatrix} 7000 & 12500 & 5500 \\ 14000 & 25000 & 11000 \end{bmatrix} \begin{bmatrix} .10 & .15 \\ .15 & .20 \\ .10 & .10 \end{bmatrix} = \begin{array}{l} \\ \text{Town 1} \\ \text{Town 2} \end{array} \begin{array}{c} \begin{array}{cc} \text{Store } A & \text{Store } B \end{array} \\ \begin{bmatrix} 3125 & 4100 \\ 6250 & 8200 \end{bmatrix} \end{array}$

2.3

1.

(c) $\begin{bmatrix} 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 \end{bmatrix}$



2.

(e) $\begin{bmatrix} 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

3.

(e) ${G_5}^2 = \begin{bmatrix} 5 & 2 & 2 & 2 & 0 & 0 \\ 2 & 3 & 2 & 2 & 1 & 1 \\ 2 & 2 & 3 & 2 & 1 & 1 \\ 2 & 2 & 2 & 3 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 1 \end{bmatrix}$

There are 2 paths of length 2 between a and d.