

Problem 2.15 Find the indicated entry of the matrix, if it is defined.

$$A = \begin{pmatrix} 1 & 3 & 1 \\ 2 & -1 & 4 \end{pmatrix}$$

(a) $a_{2,1} = 2$

(b) $a_{1,2} = 3$

(c) $a_{2,2} = -1$

(d) $a_{3,1} = \text{undefined}$

Problem 2.16 Give the size of each matrix.

$$A = \begin{pmatrix} 1 & 3 & 1 \\ 2 & -1 & 4 \end{pmatrix}$$

(a) $\begin{pmatrix} 1 & 0 & 4 \\ 2 & 1 & 5 \end{pmatrix}$ is a 2×3 matrix.

(b) $\begin{pmatrix} 1 & 1 \\ -1 & 1 \\ 3 & -1 \end{pmatrix}$ is a 3×2 matrix.

(c) $\begin{pmatrix} 5 & 10 \\ 10 & 5 \end{pmatrix}$ is a 2×2 matrix.

Problem 2.17 Perform the indicated vector operation, if it is defined.

(a) $\begin{pmatrix} 2 \\ 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 3 \\ 0 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 1 \\ 5 \end{pmatrix}$

(b) $5 \begin{pmatrix} 4 \\ -1 \end{pmatrix} = \begin{pmatrix} 20 \\ -5 \end{pmatrix}$

(c) $\begin{pmatrix} 1 \\ 5 \\ 1 \end{pmatrix} - \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} -2 \\ 4 \\ 0 \end{pmatrix}$

(d) $7 \begin{pmatrix} 2 \\ 1 \end{pmatrix} + 9 \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 14 \\ 7 \end{pmatrix} + \begin{pmatrix} 27 \\ 45 \end{pmatrix} = \begin{pmatrix} 41 \\ 52 \end{pmatrix}$

$$(e) \begin{pmatrix} 1 \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \text{undefined}$$

$$(f) 6 \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix} - 4 \begin{pmatrix} 2 \\ 0 \\ 3 \end{pmatrix} + 2 \begin{pmatrix} 1 \\ 1 \\ 5 \end{pmatrix} = \begin{pmatrix} 18 \\ 6 \\ 6 \end{pmatrix} - \begin{pmatrix} 8 \\ 0 \\ 12 \end{pmatrix} + \begin{pmatrix} 2 \\ 2 \\ 10 \end{pmatrix} = \begin{pmatrix} 10 \\ 6 \\ -6 \end{pmatrix} + \begin{pmatrix} 2 \\ 2 \\ 10 \end{pmatrix} = \begin{pmatrix} 12 \\ 8 \\ 4 \end{pmatrix}$$

Problem 2.18 Solve each system using matrix notation. Express the solution using vectors.

(a)

$$\begin{aligned} 3x + 6y &= 18 \\ x + 2y &= 6 \end{aligned} \tag{1}$$

As a matrix:

$$\left(\begin{array}{cc|c} 3 & 6 & 18 \\ 1 & 2 & 6 \end{array} \right) \tag{2}$$

Which can be reduced:

$$\left(\begin{array}{cc|c} 3 & 6 & 18 \\ 1 & 2 & 6 \end{array} \right) \xrightarrow{r_1 - 3r_2} \left(\begin{array}{cc|c} 0 & 0 & 0 \\ 1 & 2 & 6 \end{array} \right) \xrightarrow{r_1 \leftrightarrow r_2} \left(\begin{array}{cc|c} 1 & 2 & 6 \\ 0 & 0 & 0 \end{array} \right) \tag{3}$$