

16. Find the values of  $x$  and  $y$  in each of the following.

$$(a) \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 5x \\ -5y \end{pmatrix} = \begin{pmatrix} -36 \\ 32 \end{pmatrix}$$

$$(b) \begin{pmatrix} 3x & 5 \\ -4 & 1 \end{pmatrix} + \begin{pmatrix} -7 & 3 \\ 2 & 2y \end{pmatrix} = \begin{pmatrix} 2 & 8 \\ -2 & -9 \end{pmatrix}$$

$$(c) \begin{pmatrix} x+3 & 2 & 6 \\ -4 & 5 & -3 \end{pmatrix} + \begin{pmatrix} 4 & -4 & 8 \\ 2 & y-8 & 9 \end{pmatrix} = \begin{pmatrix} 4x+11+2 & -2 & 14 \\ -2 & 2y+9 & 6 \end{pmatrix}$$

$$(d) (x \ 0 \ -7) - (-6 \ 0 \ -y) = (14 \ 0 \ 19)$$

$$(e) \begin{pmatrix} -9 & 11 \\ 6 & -5 \\ -10 & 4 \end{pmatrix} - \begin{pmatrix} 3+2x & 9 \\ -3 & 7-3y \\ -13 & -5 \end{pmatrix} = \begin{pmatrix} x & 2 \\ 9 & y \\ 3 & 9 \end{pmatrix}$$

$$(f) \begin{pmatrix} 1 & -5 & 2 \\ -2 & 0 & 2x \\ 4 & -5y & -6 \end{pmatrix} - \begin{pmatrix} 5 & 3 & -7 \\ 0 & 8 & x+4 \\ 4 & -y-3 & 1 \end{pmatrix} = \begin{pmatrix} -4 & -8 & 9 \\ -2 & -8 & 3x+2 \\ 0 & 8-y & -7 \end{pmatrix}$$

17. Find the matrix  $\mathbf{W}$  in each of the following.

$$(a) 2\mathbf{W} + 3(-7 \ 5) = (3 \ -9)$$

$$(b) 3\mathbf{W} - \begin{pmatrix} 4 & -8 \\ -3 & 12 \\ 10 & 5 \end{pmatrix} = \begin{pmatrix} 11 & -1 \\ -9 & 3 \\ 14 & -17 \end{pmatrix}$$

$$(c) \frac{1}{2}\mathbf{W} + 3\begin{pmatrix} -1 & 4 \\ 8 & -3 \end{pmatrix} = 4\begin{pmatrix} 0 & -2 \\ 3 & 8 \end{pmatrix}$$

$$(d) 3\begin{pmatrix} 1 \\ -9 \end{pmatrix} - 2\mathbf{W} = 5\begin{pmatrix} -3 \\ 1 \end{pmatrix}$$

$$(e) 2\begin{pmatrix} 2 & 3 & 0 \\ 1 & -6 & 2 \end{pmatrix} - 3\mathbf{W} = \begin{pmatrix} 7 & -6 & 15 \\ 11 & -15 & 13 \end{pmatrix}$$

$$(f) 4\begin{pmatrix} 2 & 1 & 0 \\ 0 & 3 & -5 \\ -3 & 0 & 4 \end{pmatrix} - \frac{1}{5}\mathbf{W} = 3\begin{pmatrix} 0 & 0 & 5 \\ 7 & -6 & 0 \\ -4 & 3 & 10 \end{pmatrix}$$

18. The matrices  $\mathbf{P} = \begin{pmatrix} x+2y \\ x-5y \\ z \end{pmatrix}$  and  $\mathbf{Q} = \begin{pmatrix} -x+y \\ 3x-3y+6 \\ x+y \end{pmatrix}$  are equal.

(a) Find

(i) the value of the scalar  $k$  if  $k\mathbf{P} + (3k-8)\mathbf{Q} = \mathbf{O}$ , where  $\mathbf{O}$  is the  $3 \times 1$  null matrix.

(ii) the values of  $x$ ,  $y$  and  $z$ .

(b) Hence, compute  $3\mathbf{P} - 5\mathbf{Q}$ .