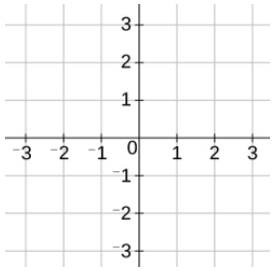
Enlargements Using Matrices

(a)

By considering the unit square, determine the matrix which describes an enlargement about the origin with scale factor 3.



(b)

Describe fully the single transformation represented by the matrix $\begin{pmatrix} \frac{5}{2} & 0 \\ 0 & \frac{5}{2} \end{pmatrix}$

(c)

Use matrix algebra to show that an enlargement of scale factor 2 about $(0, 0)$, followed by an enlargement of scale factor 1.5 about $(0, 0)$ is equivalent to an enlargement of scale factor 3 about $(0, 0)$.

(d)

The point $(-5, 3)$ is mapped onto the point (a, b) when enlarged by a scale factor 2 about the origin. Using matrix algebra, find the values of a and b.

(e)

The unit square OABC with coordinates O(0, 0), A(0, 1), B(1, 1) and C(1, 0) is mapped to OA'B'C' under matrix $\begin{pmatrix} -5 & 0 \\ 0 & -5 \end{pmatrix}$. Use matrix algebra to find the coordinates of A', B' and C'.

(f)

The point (c, d) is mapped onto the point $(-1, -4)$ when enlarged by a scale factor 0.5 about the origin. Using matrix algebra, find the values of c and d.

(g)

Use matrix algebra to show that an enlargement of scale factor 2 about $(0, 0)$, followed by an enlargement of scale factor -0.5 about $(0, 0)$ is the same as a rotation of $180°$ about the origin.

(h)

The point $(a, 3)$ is mapped to the point $(6, 2a)$ when enlarged with scale factor b about the origin. Use matrix algebra to find the possible values of a and b.

(i)

The point $(x - 4, y)$ is mapped to the point $(2y, 2x - 18.5)$ when transformed under the matrix $\begin{pmatrix} -5 & 0 \\ 0 & -5 \end{pmatrix}$. Find the values of x and y.