Step-1

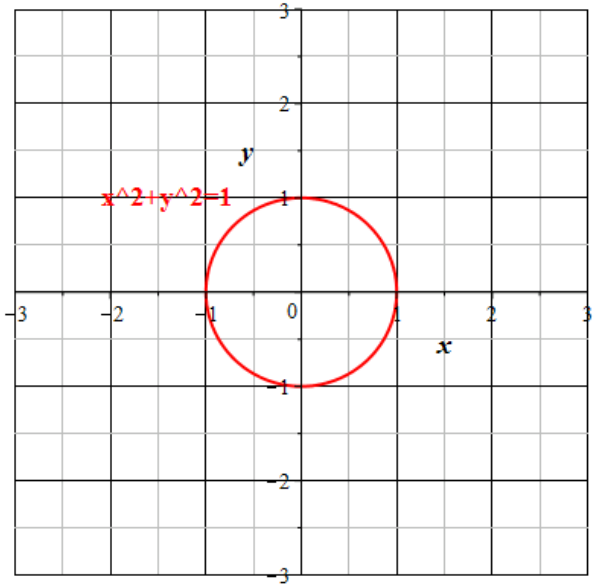
The objective is to plot the graph of the provided circle equation and also plot the diagram of the equation around the point $(2x, y)$.

Step-2

Consider the matrix is $A = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$ produces a stretching in the x-direction.

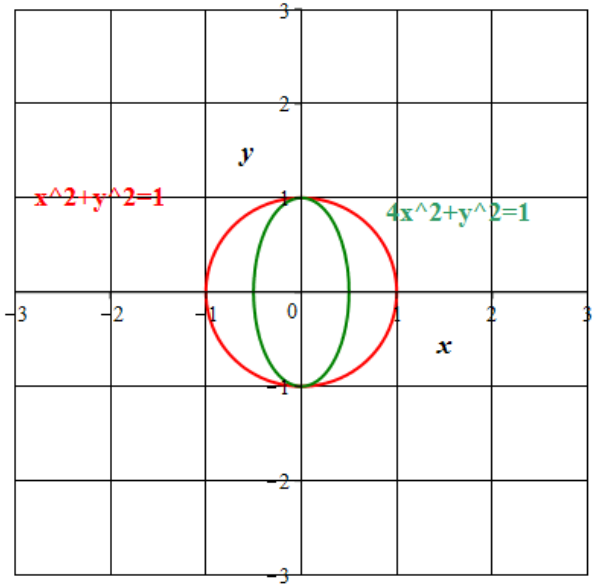
The objective is to draw the circle $x^2 + y^2 = 1$ and sketch around it the points $(2x, y)$.

The sketch of the circle is as shown below.



Step-3

After pointing the points $(2x, y)$ around the circle, obtain the graph as shown below.



Step-4

Now the matrix,

$$Ax = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$
$$= \begin{bmatrix} 2x \\ y \end{bmatrix}$$

Then,

$$\|Ax\|^2 = 1$$

So,

$$(2x)^2 + y^2 = 1$$
$$4x^2 + y^2 = 1$$

Observe that the set of all points $(2x, y)$ satisfying $\|(2x, y)\|^2 = 1$.

Hence, the shape of the curve $4x^2 + y^2 = 1$ and the shape of the resulting curve around the point is an **ellipse.**