Mon Tue Wed Thu Fri Sat

(LA)

Date: __/__/20__

Assignment No: 3)

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Q No 1)

Shear Matrix:

$$\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$

Unit square vertices

A = (0, 0)

B = (1, 0)

C = (1, 1)

D = (0, 1)

Now, shear Matrix with each vertices

$$A' = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$B' = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C' = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$$

$$D' = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

Now Translate vertex by vector (2, 3)

$A'' = (2, 3)$
$B'' = (3, 3)$
$C'' = (5, 4)$
$D'' = (4, 4)$

→ Final vertices

Q No 2)

$$\frac{(x-1)^2}{4} + \frac{(3y'+2)^2}{16} = 1$$

Substitute $y = 3y'$

$$\frac{(x-1)^2}{4} + \frac{9\left(y' + \frac{2}{3}\right)^2}{16} = 1$$

$$\frac{(x-1)^2}{4} + \left(y' + \frac{2}{3}\right)^2 = \frac{16}{9}$$

$$\frac{(x-1)^2}{4} + \left(y + \frac{2}{3}\right)^2 = \frac{16}{9}$$

$y' = y$

Now Multiply 9 on b.s

$$4(x-1)^2 + 9\left(y+\frac{2}{3}\right)^2 = 16$$

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Final equation of the stretched ellipse along the y-axis by a factor of 3

Q No 3)

shear Matrix:

$$\begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}$$

Transform a point (x, y) to a new point (x', y')

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x \\ -2x+y \end{bmatrix}$$

$x' = x$

$y' = -2x+y$

eq = $(x+1)^2 + (y-2)^2 = 9$

$= (x+1)^2 + ((-2x+y)-2)^2 = 9$

$= (x+1)^2 + (y' + 2x - 2)^2 = 9$

Expand = $(x+1)^2$. $x^2 + 2x + 1$

Expand = $(y' + 2x - 2)^2$

$(y' + 2x - 2)^2 = (y')^2 + (2x-2)^2 + 2y'(2x-2)$

$= y'^2 + (2x-2)^2 + 2y'(2x-2)$

$= y'^2 + 4x^2 - 8x + 4 + 4xy' - 4y'$

$x^2 + 2x + 1 + y'^2 + 4x^2 - 8x + 4 + 4xy' - 4y' = 9$

$5x^2 + y'^2 + 4xy' - 4y' - 6x + 5 = 9$

$\boxed{5x^2 + y'^2 + 4xy' - 4y' - 6x - 4 = 0}$

↓

equation of the sheared circle

Q No 4)

$x = -2$

point $(x, 2x-3)$

$x = -2$ is $x - (-2) = x + 2$

$-2 - (x+2) = -4 - x$

$x' = -4 - x$

$x = -4 - x'$

Now substitute $x = -4 - x'$ in the equation $y = 2x - 3$

$y = 2(-4 - x') - 3$

$y = -8 - 2x' - 3$

$y = -2x' - 11$

The reflection of the line $y = 2x - 3$ and along the line $x = -2$ is

$y = -2x - 11$