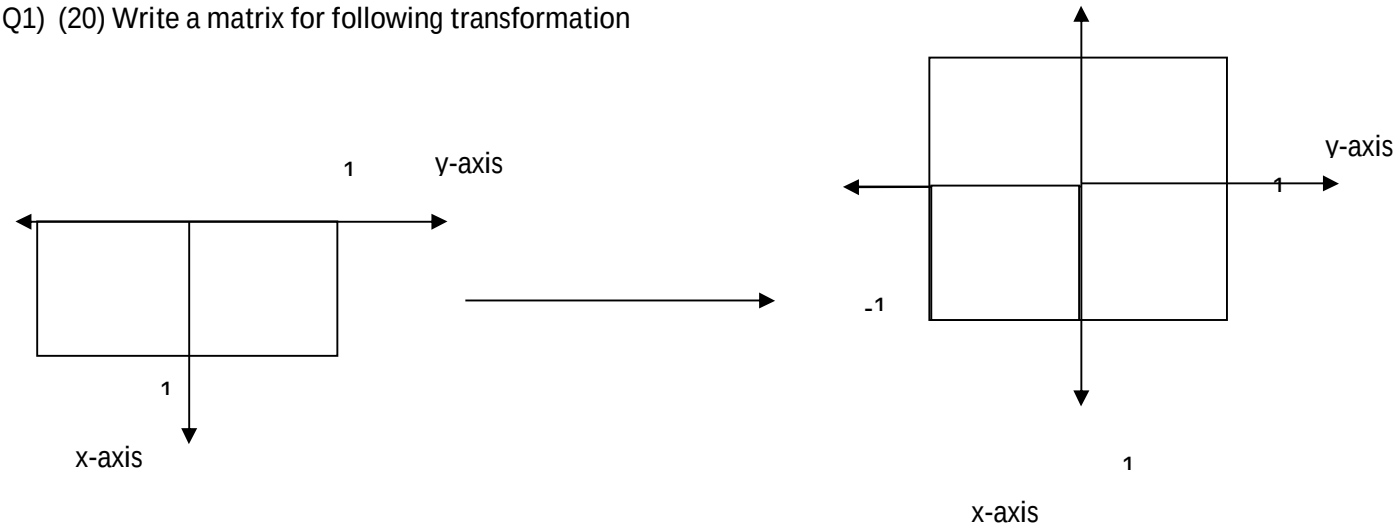
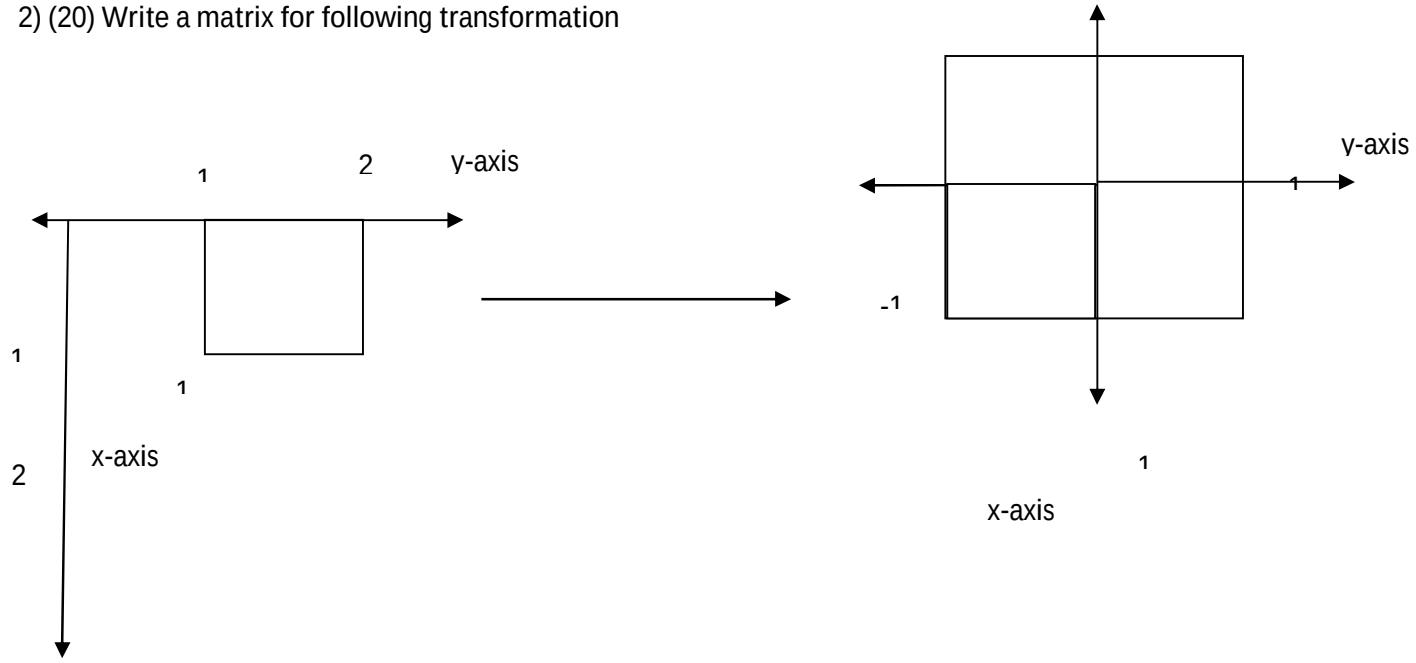
Q1) (20) Write a matrix for following transformation



2) (20) Write a matrix for following transformation

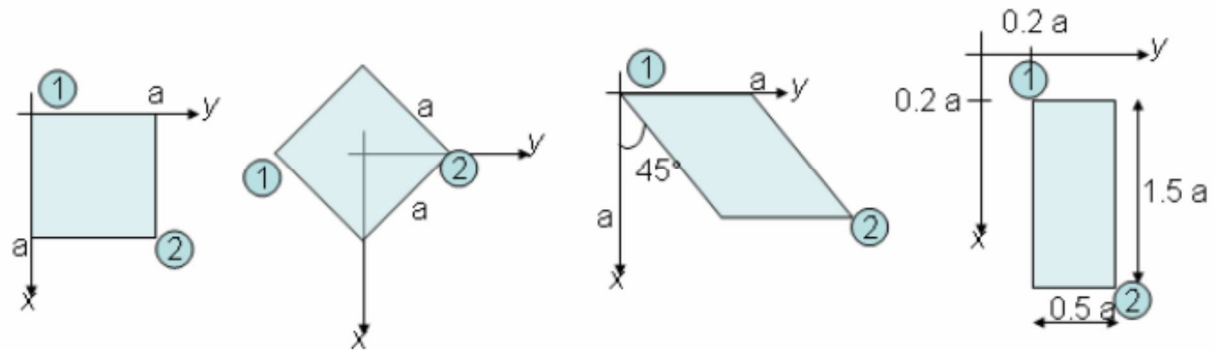


3) (20) Find above matrix using Pseudo Inverse Method.

Q) What is the difference between computer vision, image processing and computer graphics.

Q) Does it matter if we do rotation before scaling or scaling before rotation? Justify your answer with a reason.

Q1) Consider the shapes shown in the figure. Give affine parameters to transform the first shape into the other three.



Q2) Consider the following figure.

a) Write an affine matrix that would perform the rotation on this figure around its center.
b) Write an affine matrix that would perform the scaling of 2 in x and y direction.
c) Write a matlab code (on paper) that applies the transformation matrix of part b to the above figure, and generate a transformed image. (Hint: use the backward transformation. You have to write two nested for loops to apply backward transformation to each pixel. Rather than bilinear interpolations, just take the floor of the coordinates).
d) Repeat part c using Bilinear Interpolation
e) Repeat part d, while ensuring that no part of the transformed image is cropped.

Q2) Write the following matrices

Scaling in 2D (both dim)		Shear in 2D in y	Rotation in 2D

Translation in 2D in x	Translation in 2D in y	Affine Transformation	Projective Transformation
Scaling in 3D	Shear in 3D	Rotation in 3D	Translation in 3D

Q3) Suppose we have a cube with following 8 points.

Point 1 (x, y, z) = (0, 0, 0)

Point 2 (x, y, z) = (1, 0, 0)

Point 3 (x, y, z) = (0, 1, 0)

Point 4 (x, y, z) = (1, 1, 0)

Point 5 (x, y, z) = (0, 0, 1)

Point 6 (x, y, z) = (1, 0, 1)

Point 7 (x, y, z) = (0, 1, 1)

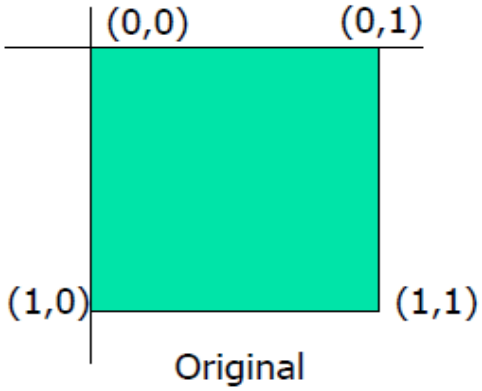
Point 8 (x, y, z) = (1, 1, 1)

a) Apply shear in x direction w.r.t y (exy =1)and z (exz =1). Make a new diagram

Q4) Consider the following picture

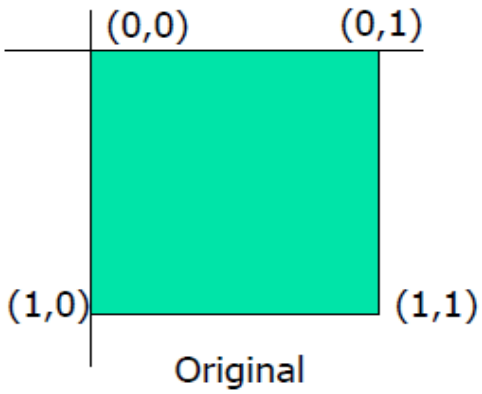
Make a histogram of the above figure.

Q5) Q2) Consider the following figure



Plot the new figure after applying the scaling of 2 in x and y dimension in the original figure followed by rotation of 45 degree in counter clockwise direction (around origin i.e., (0,0)).

Q6) Consider the following figure



a) Make a new figure that would be the result of applying Affine Transformation to the above figure
b) Make a new figure that would be the result of applying Projective Transformation to the above figure.

Q7) Prove that parallel lines remain parallel after undergoing any 2D affine transformation. Show that this is not the case with projective transformation

Q8) Suppose we have a cube with following 8 points.

Point 1 (x, y, z) = (0, 0, 0)

Point 2 (x, y, z) = (1, 0, 0)

Point 3 (x, y, z) = (0, 1, 0)

Point 4 (x, y, z) = (1, 1, 0)

Point 5 (x, y, z) = (0, 0, 1)

Point 6 (x, y, z) = (1, 0, 1)

Point 7 (x, y, z) = (0, 1, 1)

Point 8 (x, y, z) = (1, 1, 1)

a) Apply shear in x direction w.r.t y (exy =1)and z (exz =1). Make a new diagram

b)Apply shear in y direction w.r.t y (eyx =3)and z (eyz =2). Make a new diagram

c) Apply shear in z direction w.r.t y (ezx =2)and z (ezy =3). Make a new diagram

d) Apply shear in x direction w.r.t y (exy =1)and z (exz =1), shear in y direction w.r.t y (eyx =3)and z (eyz =2), shear in z direction w.r.t y (ezx =2)and z (ezy =3). Make a new diagram