Roll No. | | | | | | | | |

KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060
EVEN SEMESTER 2018-2019
CONTINUOUS ASSESSMENT TEST I – FEBRUARY 2019
(Regulations 2014)

Programme : BE Branch : CSE Semester : VI	Date : 20.02.2019 Time : 9.00 am – 10.30 am
Course Code : 14CSC61 Course Name : Graphics and Multimedia	Duration : 1 ½ Hours Max. Marks : 50

PART - A (10 × 2 = 20 Marks)
ANSWER ALL THE QUESTIONS

1.	Identify the applications of computer graphics.	CO1	K1
2.	Differentiate between bit map and pixel map	CO1	K2
3.	Name any four interactive input devices.	CO1	K1
4.	Determine how many intermediate points will be calculate to draw a line with the end points (1,2) (3,4) using DDA.	CO1	K3
5.	State the purpose of set interiorcolourindex (fc) and setinteriorstyle(fs).	CO1	K2
6.	Compare aliasing and ant aliasing methods.	CO1	K2
7.	Apply shearing operation to the following coordinators(0,0) (1,0) (0,1) and (1,1) with shearing parameter values of ½ relative to the line Y_{ref}=-1	CO2	K3
8.	Give an example to show reflection of an object about Y-axis. Draw the object.	CO2	K3
9.	Define Traversal.	CO2	K1
10.	Show the methods used for editing the structure.	CO2	K2

Part – B (3× 10 = 30 Marks)
ANSWER ALL THE QUESTIONS

11. a) i) Draw the line with and points (0,0) and (4,6) using Bresenhem's line drawing algorithm. (6) CO1 K3

ii) Recall the various methods used in text attribute. (4) CO1 K1

(OR)

b) i) Determine the intermediate points to draw the line with end points(1,2) and (5,7) using DDA line drawing algorithm. (6) CO1 K3

ii) State the working principle of CRT with neat diagram. (4) CO1 K1

12. a) Make use of the midpoint method to derive decision parameter for generating points along circle. Compute the pixel location in the first octant with the centre(4,5) and r=4. (10) CO1 K3

(OR)

b) Given an ellipse of major axis and minor axis r_y=8 , r_x=10. Write and demonstrate the midpoint ellipse algorithm by determining the raster positions along the ellipse path. (10) CO1 K3

13. a) Illustrate the basic concept of 2D- geometrical transformations with an example. (10) CO2 K2

(OR)

b) Discuss the working of 2D scaling with respect to origin and with respect to fixed(pivot) point with suitable example. (10) CO2 K2

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	18	35	47	-	-	-

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PERUNDURAI (TK) ... 060.

P.R	[signature]

Name and signature of Hall Supdt. with Date

KONGU ENGINEERING COLLEGE

PERUNDURAI ERODE - 638 060.

(Autonomous)

Estd : 1984

Name of the Student	SINDHUJA.P	Register No.	1 6 C S R 1 9 2
Programme	B.E	Branch & Semester	CSE - VI
Course Code and Name	14CSC61- Graphics and Multimedia	Date	20.02.19
		No.of Pages Used	17

MARKS TO BE FILLED IN BY THE EXAMINER

PART - A		PART - B			Grand Total Max. Marks : 50
Question No.	Max Marks : 2	Question No.		Max Marks : 10	
1	2	11	i)	5	39/50
2	2		ii)	4	
3	2	12	i)	7	78%
4	2		ii)		
5	2	13	i)	9	verified by P.Sindhuja.
6	0		ii)		
7	2	14	i)		
8	2		ii)		
9	0				
10	0				
TOTAL	14	TOTAL		25	

Total marks in words : Seven Eight

INSTRUCTION TO THE CANDIDATE

1. Check the Question Paper, Programme, Course Code, Branch Name etc., before answering the questions.
2. Use both sides of the paper for answering questions.
3. POSSESSION OF ANY INCRIMINATING MATERIAL AND MALPRACTICE OF ANY NATURE IS PUNISHABLE AS PER RULES.

R. Manjula ...
Name of the Examiner

[signature] 20/2/19
Signature of the Examiner with Date

PART-A.

1. Identify the applications of computer graphics.

Applications of computer graphics are

i) User Interface
ii) Automation
iii) Medical Field
iv) Design of Robots and Machineries
v) Education.

2. Differentiate between Bitmap and pixel map.

Bitmap	Pixel Map.
In a black and white image processing, the pixel points will be either ON or OFF. So, it need one bit per pixel. It is called Bitmap.	In a image has c... and intensity, the ... points are plotter. ... are multiple bits p... pixel. It is called pixelmap.

3. Name any four interactive input devices.

The interactive input devices are

1. Keyboard
2. Mouse
3. Display Buffer
4. CPU.
5. I/O port.

4. Determine how many intermediate points will be calculated to draw a line with the end points (1,2) (3,4) using DDA.

$x_1 = 1$, $x_2 = 3$

$y_1 = 2$, $y_2 = 4$

$dx = x_2 - x_1 = 3-1 = 2$

$dy = y_2 - y_1 = 4-2 = 2$

$\therefore$ steps = 2, $\therefore$ Two intermediate points are calculated using the endpoints (1,2) & (3,4).

The points are (1,2), (2,3) & (3,4)

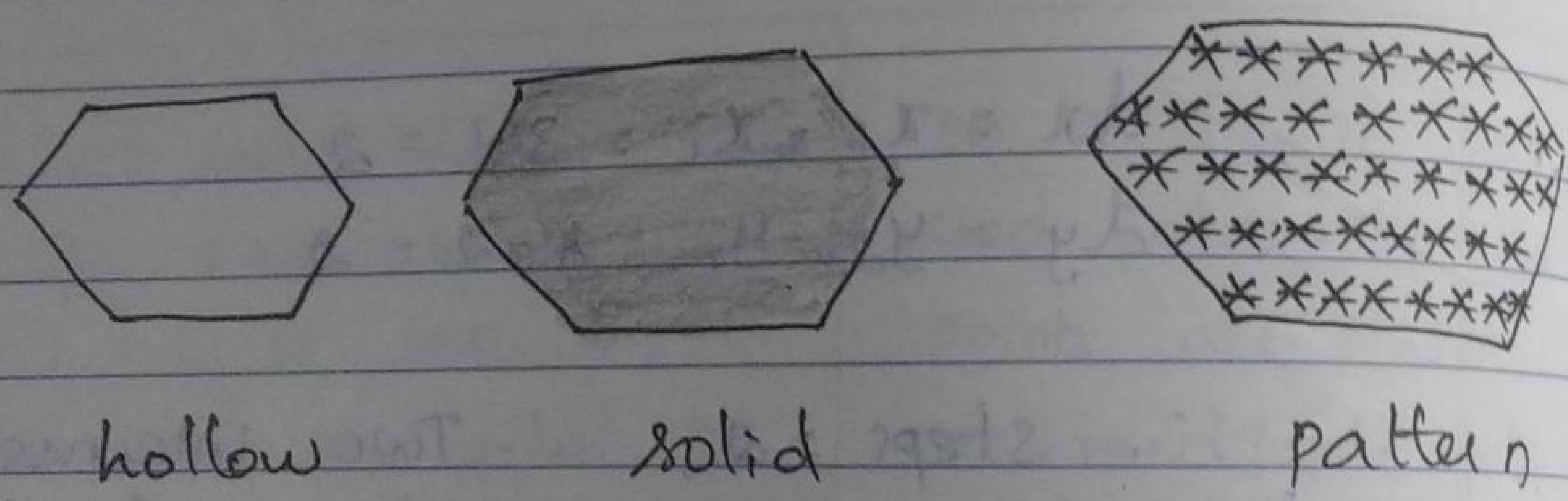
5. State the purpose of setinteriorcolourindex (fc) and setinteriorstyle (fs).

setinteriorstyle (fs) - provides the style of the inter design of the given shape.

fs - denotes the style - hollow, solid, pattern

Another one style is hatch - it's either parallel or crossed line.

set interior colorindex (fc) - Gives the colour for the interior design. fc - is the colour index.



6. Compare aliasing and ant aliasing methods.

7. Apply shearing operation to the following coordinators (0,0) (1,0) (0,1) and (1,1) with $sh_x = 1/2$ relative to the line $y_{ref} = -1$.

$$\text{Shearing} = \begin{bmatrix} 1 & sh_x & -sh_x \cdot y_{ref} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

coordinates:

(0,0)

$$\text{Shearing} \begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 1/2 & 1/2 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1/2 \\ 0 \\ 1 \end{bmatrix}$$

$1 + 1/2$

(1,0)

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 1/2 & 1/2 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 3/2 \\ 0 \\ 1 \end{bmatrix}$$

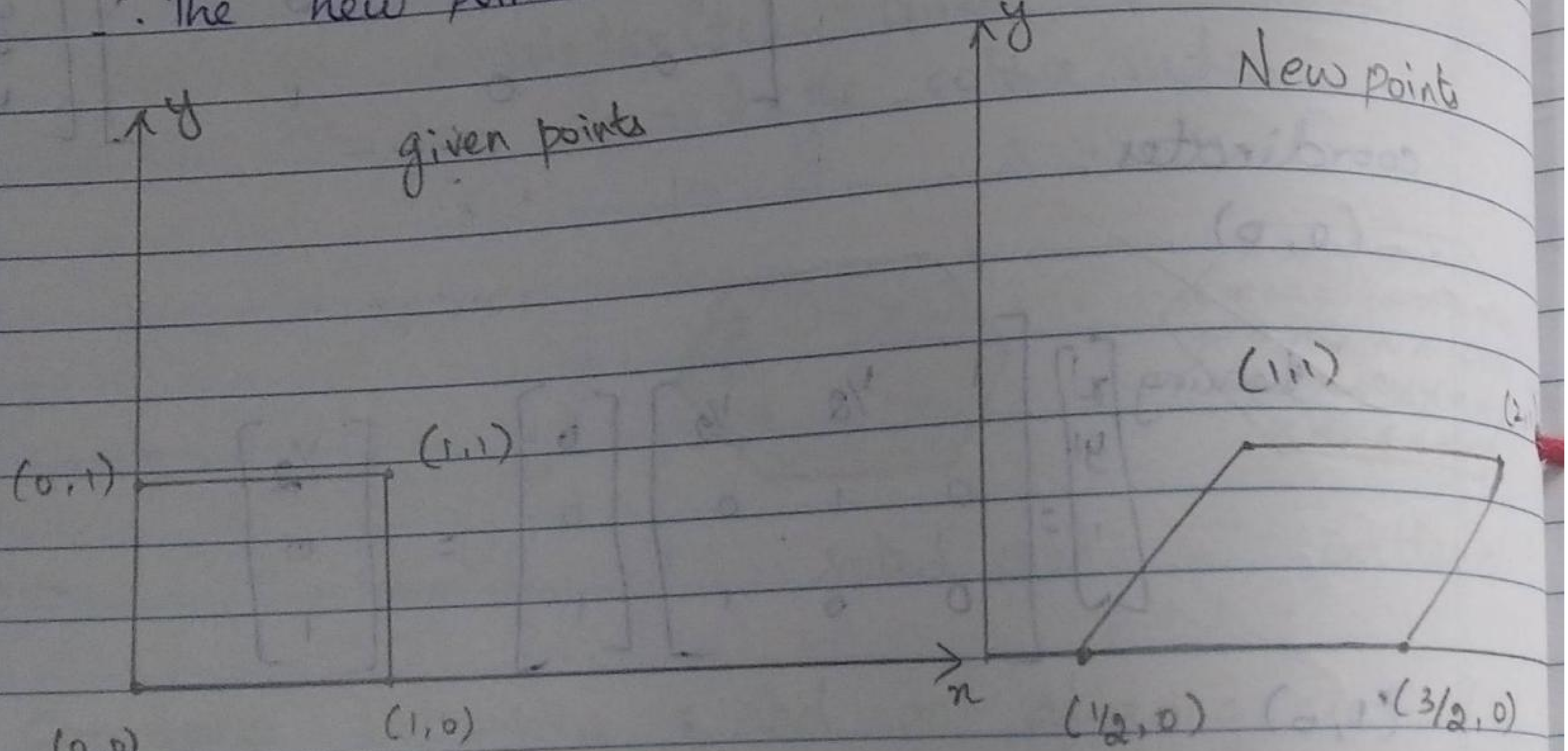
(0,1)

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

(1,1)

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

∴ The new points are $(1/2, 0)$, $(3/2, 0)$, $(1,1)$, $(2,1)$

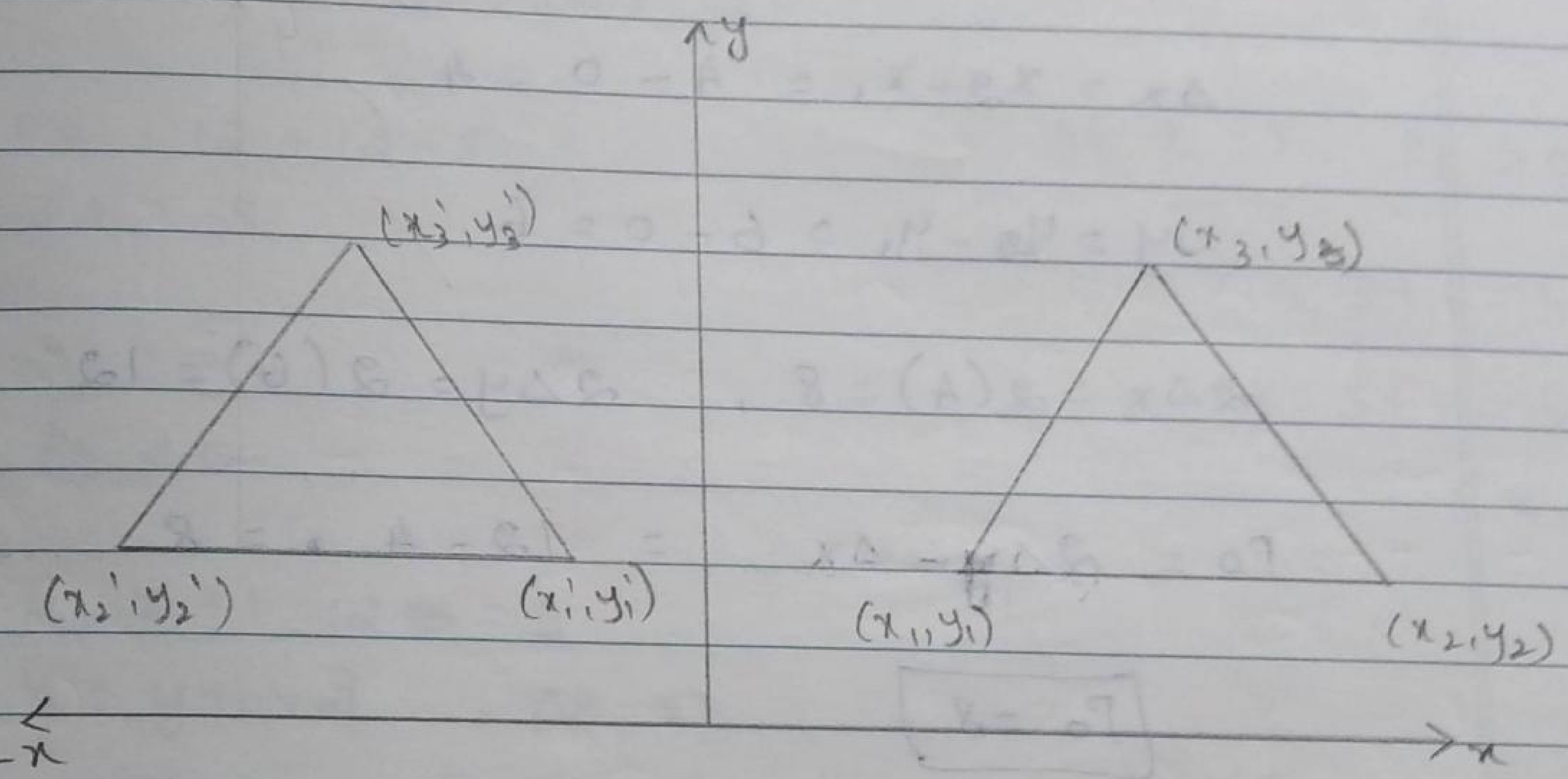


10. Show the methods used for editing the structu

8. Give an example to show reflection of an object about y-axis. Draw the object.

In y-axis reflection, $y' = y$

$x' = -x$.



Reflection: $\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$

9. Define Traversal.

Traversal is the movement of an object from one location to another by using some algorithm.

PART-B.

11. a) (i) Draw the line with end points (0,0) and (4,6) using Bresenhem's line drawing algorithm.

$(x_1, y_1) = (0,0)$ and $(x_2, y_2) = (4,6)$

$\Delta x = x_2 - x_1 = 4 - 0 = 4$

$\Delta y = y_2 - y_1 = 6 - 0 = 6$

$2\Delta x = 2(4) = 8$, $2\Delta y = 2(6) = 12$.

$P_0 = 2\Delta y - \Delta x = 12 - 4 = 8$

$\boxed{P_0 = 8}$

$\Delta y > \Delta x \Rightarrow$ 6 steps.

At $k = 0$,

$P_0 > 0$, $8 > 0$.

then

$x = x + 1$

$x = 1$, $y = y + 1$

$y = 0 + 1$

$y = 1$

points = (1, 1)

$P_1 = 8 + 12 - 8$

$P_1 = 12$

At $k = 1$,

$P_1 > 0$,

$x = 1 + 1 = 2$

$y = 1 + 1 = 2$ $\quad (2, 2)$

$P_2 = 12 + 12 - 8$

$P_2 = -8$

At $k = 2$,

$P_2 < 0$

$x = x + 1 = 2 = 2$

$y = y + 1 \Rightarrow 3$ $\quad (2, 3)$

$P_3 = -8 + 12 - 8 = -16 + 12$

$P_3 = -4$

At $k = 3$,

$P_3 < 0$

$x = 2 = 2$

$y = 3 + 1 = 4$

$(2, 4)$

$P_4 = -4 + 12 - 8$

$P_4 = -12 + 12 = 0$

At $k = 4$,

$P_4 \geq 0$,

$x = x = 2 + 1 = 3$

$y = 4 + 1 = 5$

$(3, 5)$

$P_5 = 0 + 12 - 8$

$P_5 = 4$

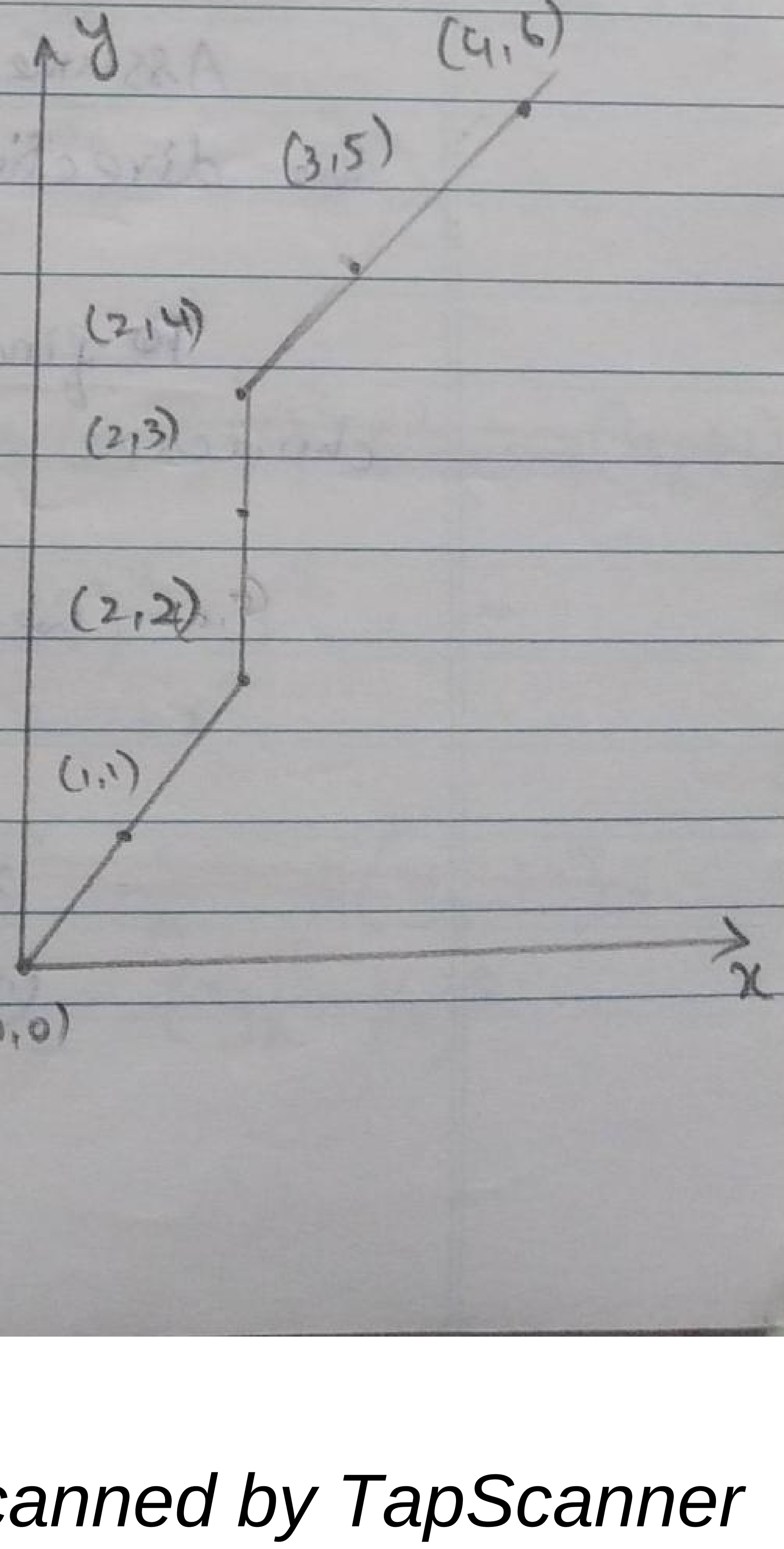
At $k = 5$, $P_k > 0$,

$x = 3 + 1 = 4$

$y = 5 + 1 = 6$

$(4, 6)$

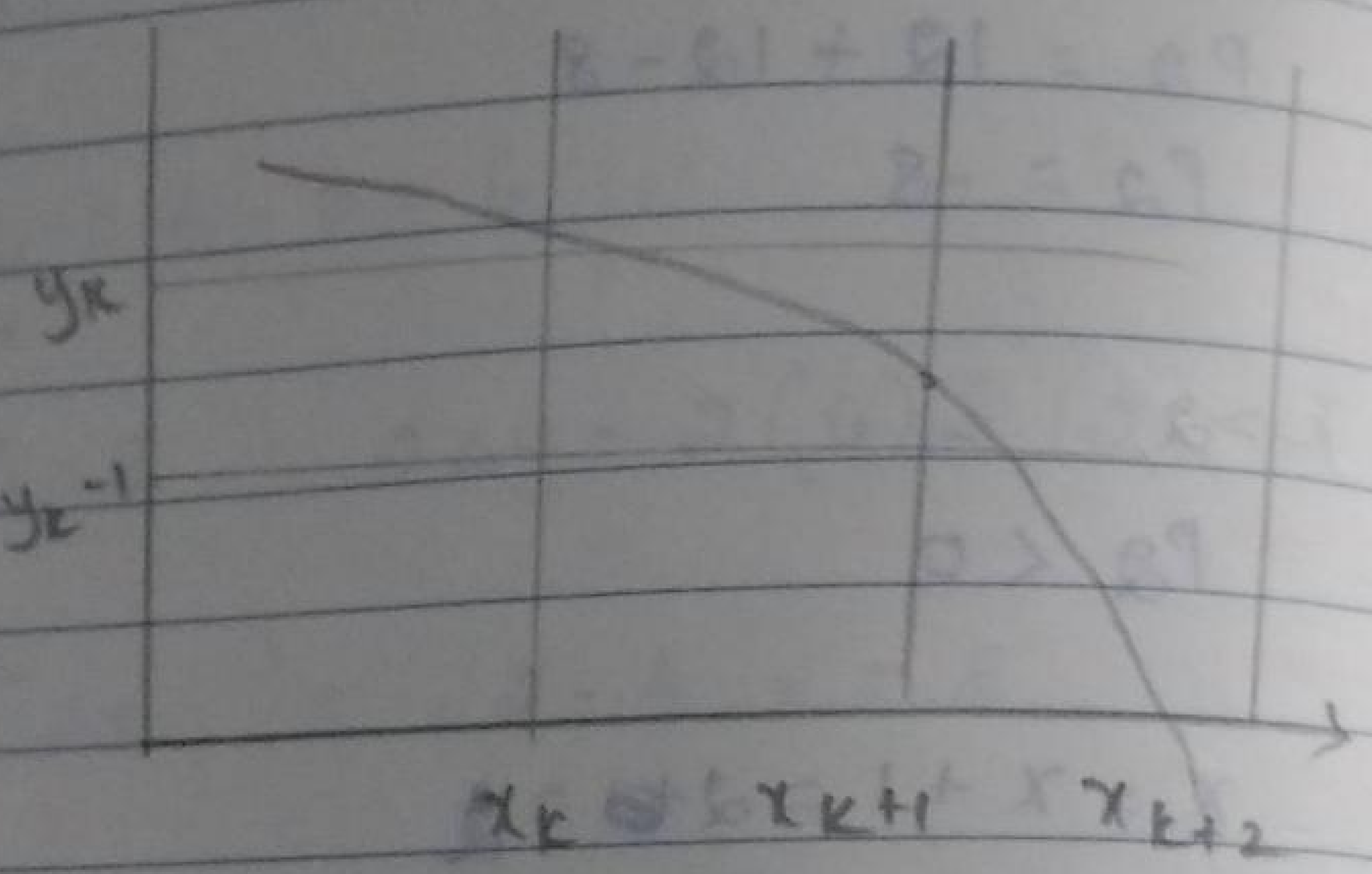
$P_6 =$



PART - B

12. a) Make use of the midpoint method to derive decision parameter for generating points along circle. Compute the pixel location in the first octant with the centre (4,5) and r=4.

(i) compute the radius r.



Assume, we have the points x_k, y_k and move in the direction of x.

To find the points of y at x_{k+1}, we have two choices y_k or $y_k - 1$.

we know that

$$f(x, y) = x^2 + y^2 - r^2$$

$x^2 + y^2 = r^2$ (At origin)

$(x - x_c)^2 + (y - y_c)^2 = r^2$. (At some point)

$$\text{Midpoint} = \frac{y_k + y_k - 1}{2}$$

$$= \frac{2y_k - 1}{2}$$

$$\text{Midpoints} = y_k - \tfrac{1}{2}$$

The points are $(x_k + 1, y_k - \tfrac{1}{2})$.

$$P_k = f(x, y) = x^2 + y^2 - r^2$$

$$P_k = (x_k + 1)^2 + (y_k - \tfrac{1}{2})^2 - r^2$$

$$P_{k+1} = (x_{k+1} + 1)^2 + (y_{k+1} - \tfrac{1}{2})^2 - r^2$$

$$= ((x_k + 1) + 1)^2 + ((y_k + 1) - \tfrac{1}{2})^2 - r^2$$

$$P_{k+1} = (x_k + 1)^2 + 1 + 2(x_k + 1) + \cancel{(y_k + 1)^2 + \tfrac{1}{4} - 2(y_k + 1)}$$

$$((y_k + 1) - \tfrac{1}{2})^2 - r^2$$

$$P_{k+1} - P_k = \cancel{(x_k + 1)^2} + 1 + 2(x_k + 1) \cancel{+ (y_k + 1)^2 + \tfrac{1}{4} - 2(y_k + 1)}$$

$$+ ((y_k + 1) - \tfrac{1}{2})^2 \cancel{- r^2} - \cancel{(x_k + 1)^2} - (y_k - \tfrac{1}{2})^2 \cancel{+ r^2}$$

$$P_{k+1} - P_k = 1 + 2(x_k + 1) \cancel{+ (y_k + 1)^2 + \tfrac{1}{4} - 2(y_k + 1)}$$

$$+ ((y_k + 1) - \tfrac{1}{2})^2 - (y_k - \tfrac{1}{2})^2$$

If $P_k = 0$, lies on the circumference of the

If $P_k < 0$, it lies inside the circle, then y_{k+1}

If $P_k > 0$, it lies outside the circle, then $y_{k+1} =$

$$P_{k+1} - P_k = 1 + 2x_{k+1} + \cancel{y_{k+1}^2} \cancel{+ \frac{1}{4}} - 2y_{k+1} - (y_k \ldots$$

$((y_k + 1) - \frac{1}{2})^2$

If $P_k < 0$, then $y_{k+1} = y_k$.

$$P_{k+1} = P_k + 1 + 2x_{k+1} + \cancel{y_k^2} + \cancel{\frac{1}{4}} \cancel{- 2y_k} - \cancel{(y_k - \frac{1}{2})}$$

$((y_k) - \frac{1}{2})^2$

$$\cancel{= P_k + 1 + 2x_{k+1} + y_k^2 + \frac{1}{4} - 2y_k - y_k^2 - \frac{1}{4}} \ldots$$

$$P_{k+1} = P_k + 1 + 2x_{k+1}.$$

$$\boxed{P_{k+1} = P_k + 1 + 2(x_k + 1)}$$

If $P_k > 0$, then $y_{k+1} = y_k - 1$

$$P_{k+1} = P_k + 1 + 2x_{k+1} \cancel{+ (y_k - 1)^2 + \frac{1}{4} - 2(y_k - 1)} \ldots$$

$$+ ((y_k - 1) - \frac{1}{2})^2 - (y_k - \frac{1}{2})^2$$

$$\cancel{= P_k + 1 + 2(x_k+1) + y_k^2 + 1 - 2y_k + \frac{1}{4} - 2y_k + 2 - y_k^2 - \frac{1}{4} + y_k}$$

$$= P_k + 1 + 2(x_k+1) + (y_k - 1)^2 + \frac{1}{4} - (y_k - 1) - (y_k - 1/2)^2$$

$$= P_k + 1 + 2(x_k+1) + \cancel{y_k^2} + 1 - 2y_k + \cancel{1/4} - \cancel{y_k} + 1 - \cancel{y_k^2} - \cancel{\frac{1}{4}} + \cancel{y_k}$$

$$= P_k + 1 + 2(x_k+1) - 2y_k + 2$$

$$P_{k+1} = P_k + 1 + 2(x_k+1) - 2(y_k + 1)$$

Then

$$\cancel{P_0 = P_k + 1 + 2x_0 + (y_0 - 1/2)^2 - (y_0 - 1/2)^2} \qquad (x_0, y_0) = (0, r)$$

$$\cancel{= 1 + 2x_0 +}$$

$$P_0 = (x_0 + 1)^2 + (y_0 - 1/2)^2 - r^2$$

$$= x_0 + 1 + 2x_0 + y_0^2 + \frac{1}{4} - y_0 - r^2$$

$$= 0 + 1 + 0 + \cancel{r^2} + \frac{1}{4} - r - \cancel{r^2}$$

$= 1 + \frac{1}{4} - r$

$$\boxed{P_0 = \frac{5}{4} - r}$$

centre (4,5) and $r = 4$. | $x = -$

$(0, r) = (0, 4)$

$k = 0,$

$P_0 = 1 - r = 1 - 4 = 3$

$P_0 > 0,$

$x = x + 1 = 0 + 1 = 1$

$y = 4 - 1 = 3$

$\cancel{k} \rightarrow \quad P_1 = 3 + 1 + 2(1) - 2(3)$

$P_1 = 6 - 6 = 0$

$k = 1$

$P_1 > 0,$

$x = x + 1 = 2$

$y = 4$

$P_2 = 6 + 1 + 4$

$P_2 = 11$

13.a) 2-D geometrical transformation.

Transformation,

changing the size, shape and location of an object.

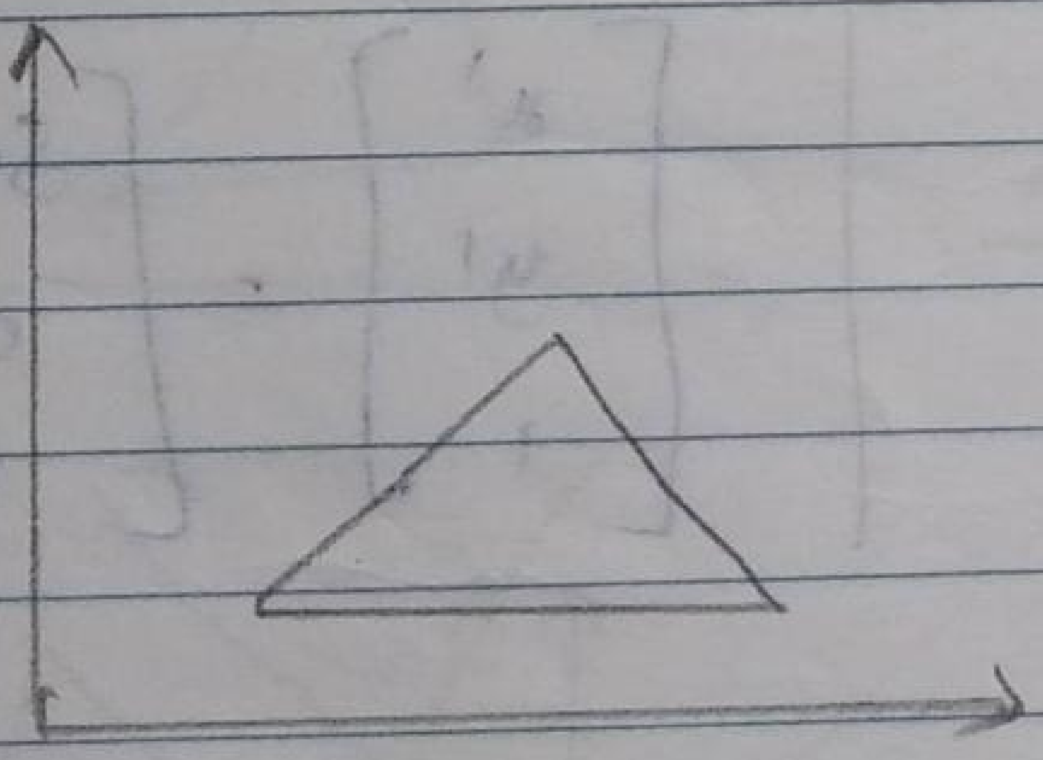
1. Translation
2. Rotation
3. Shearing
4. scaling
5. Reflection.

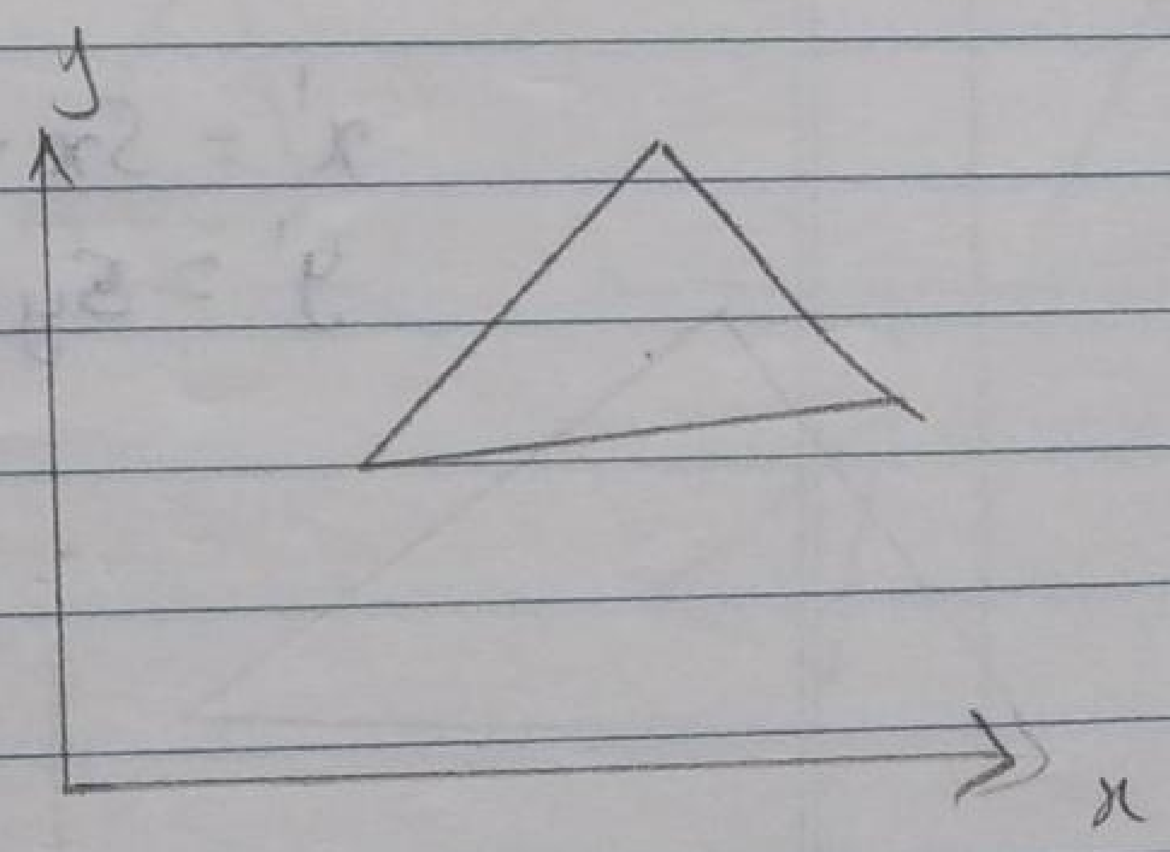
1. Translation:

Homogeneous

$$P' = P + t$$

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x + tx \\ y + ty \end{bmatrix}, \qquad \begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & tx \\ 0 & 1 & ty \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$



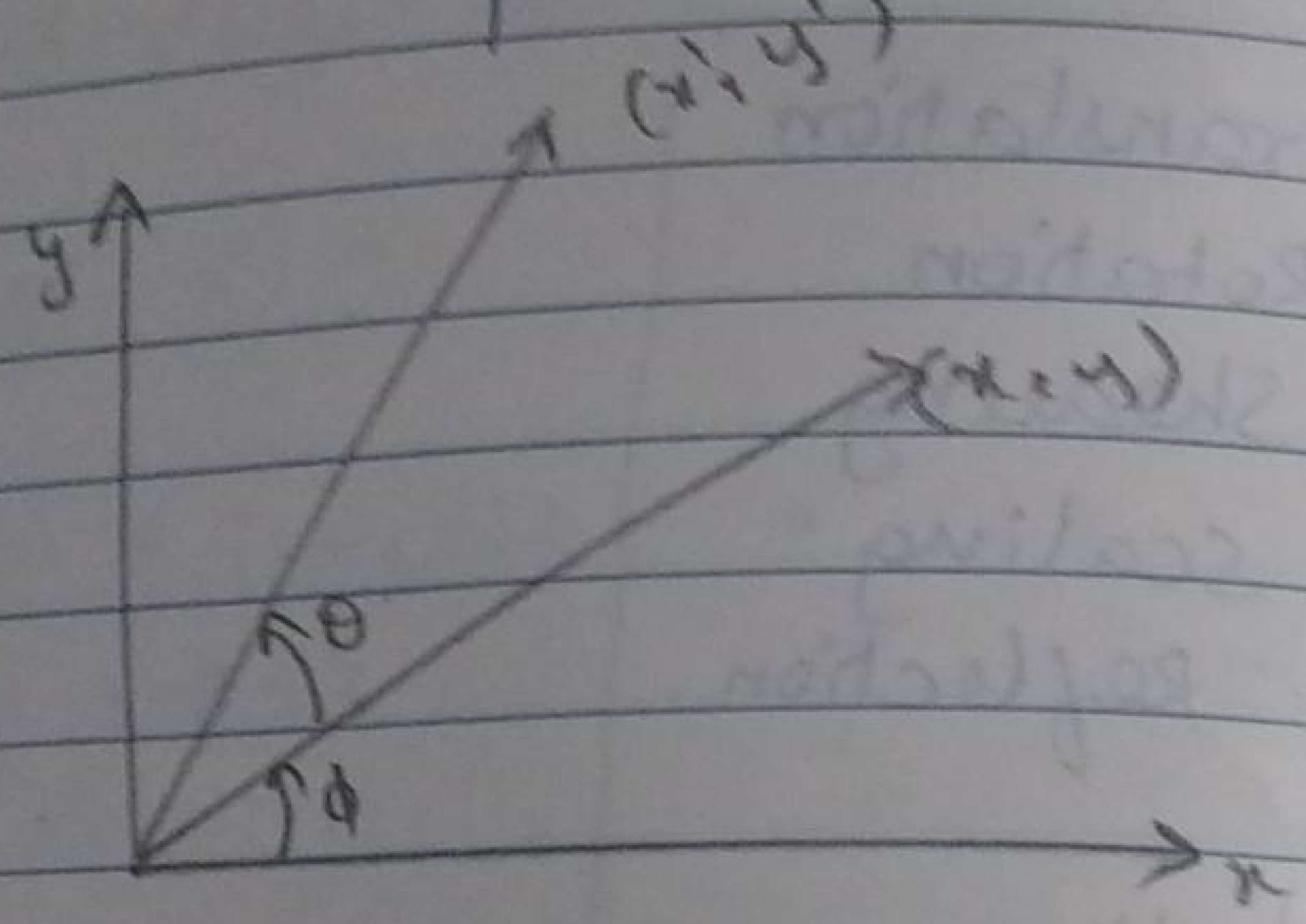


Rotation:

$$p' = R(\theta) \cdot P$$

$$x' = x\cos\theta - y\sin\theta$$
$$y' = y\cos\theta + x\sin\theta.$$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$



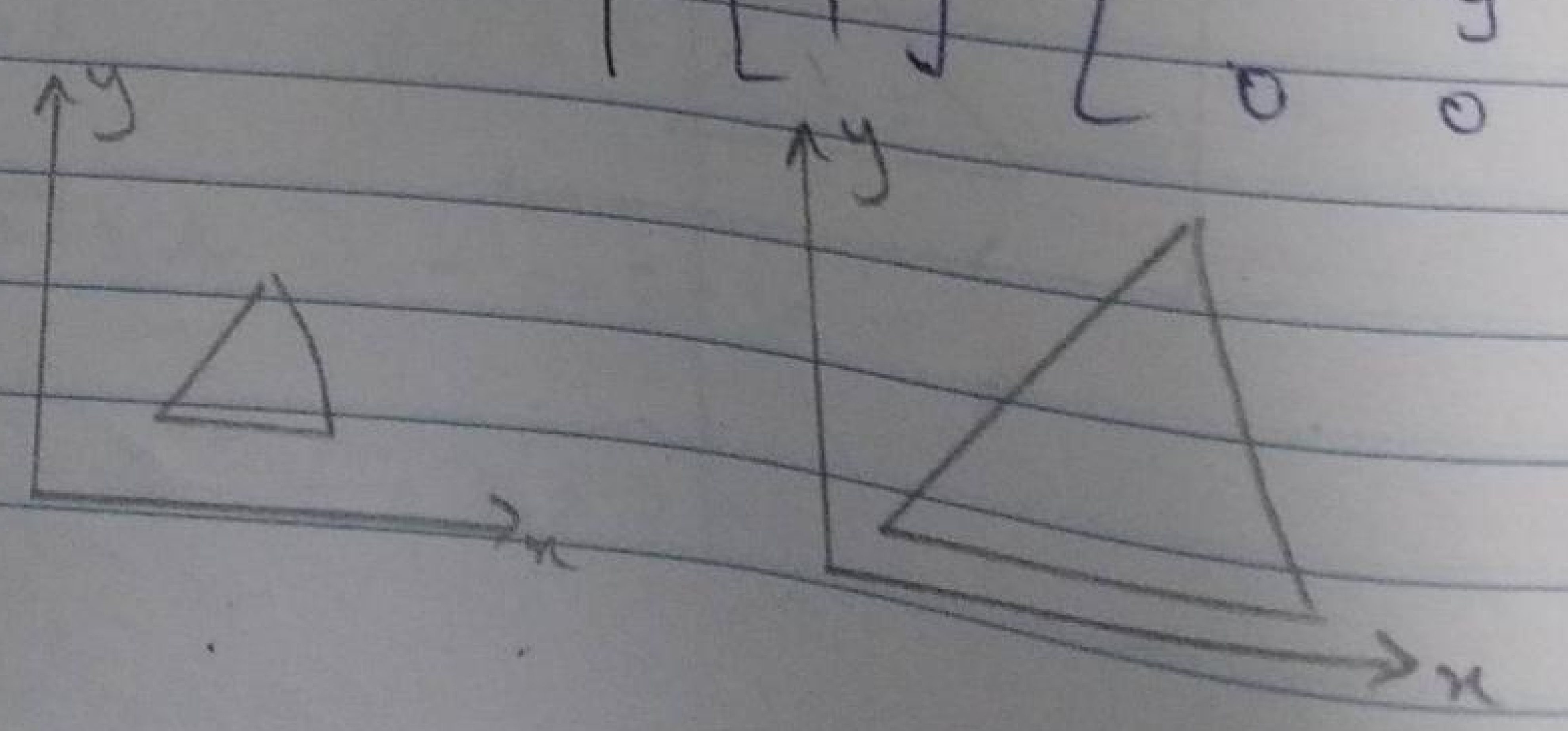
Scaling:

1. Uniform Scaling - x & y axis change in same
2. Different Scaling - x & y axis change in different value

change in size.

$$x' = S_x \cdot x$$
$$y' = S_y \cdot y.$$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$



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Shearing:

With respect to x-axis

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & sh_x & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

With respect to y-axis

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ sh_y & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

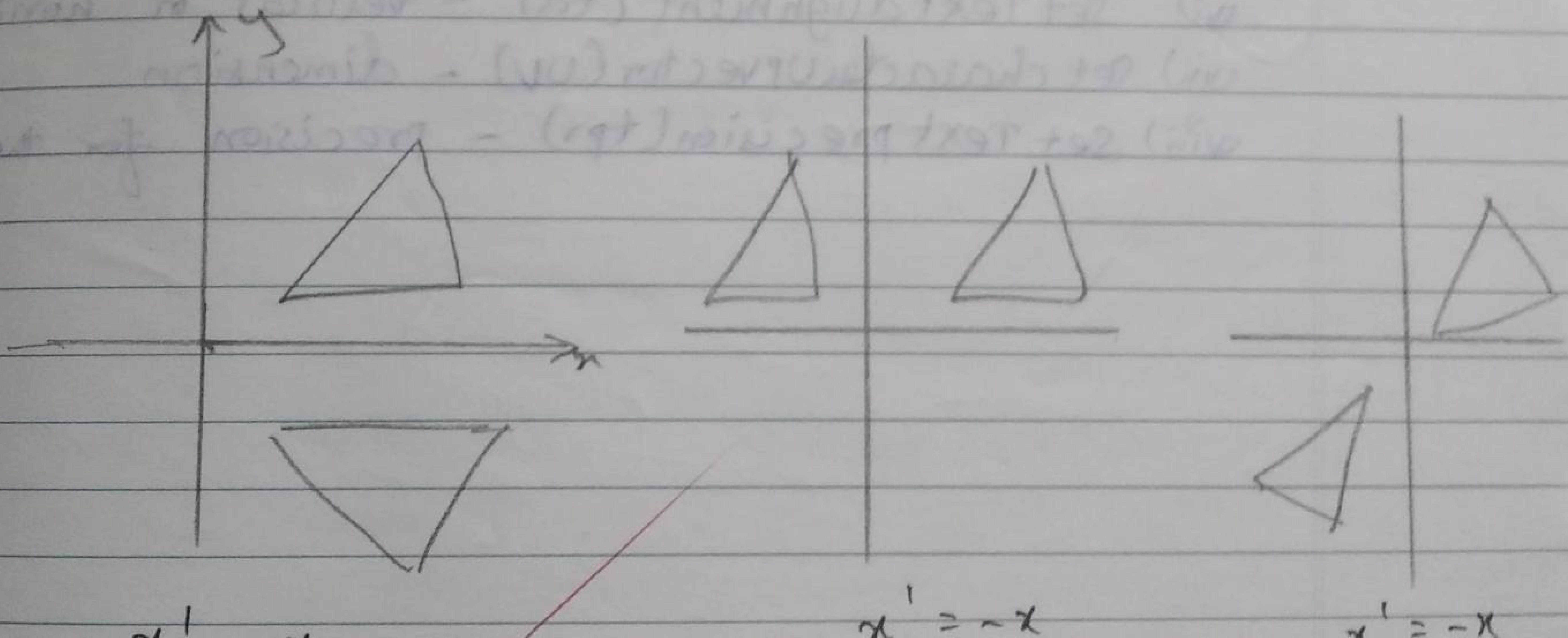
With respect to x point

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & sh_x & -sh_x \cdot y_{ref} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

with respect to y-point

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ sh_y & 1 & -sh_y x_{ref} \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Reflection:



$x' = x$

$y' = -y$

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

$x' = -x$

$y' = y$

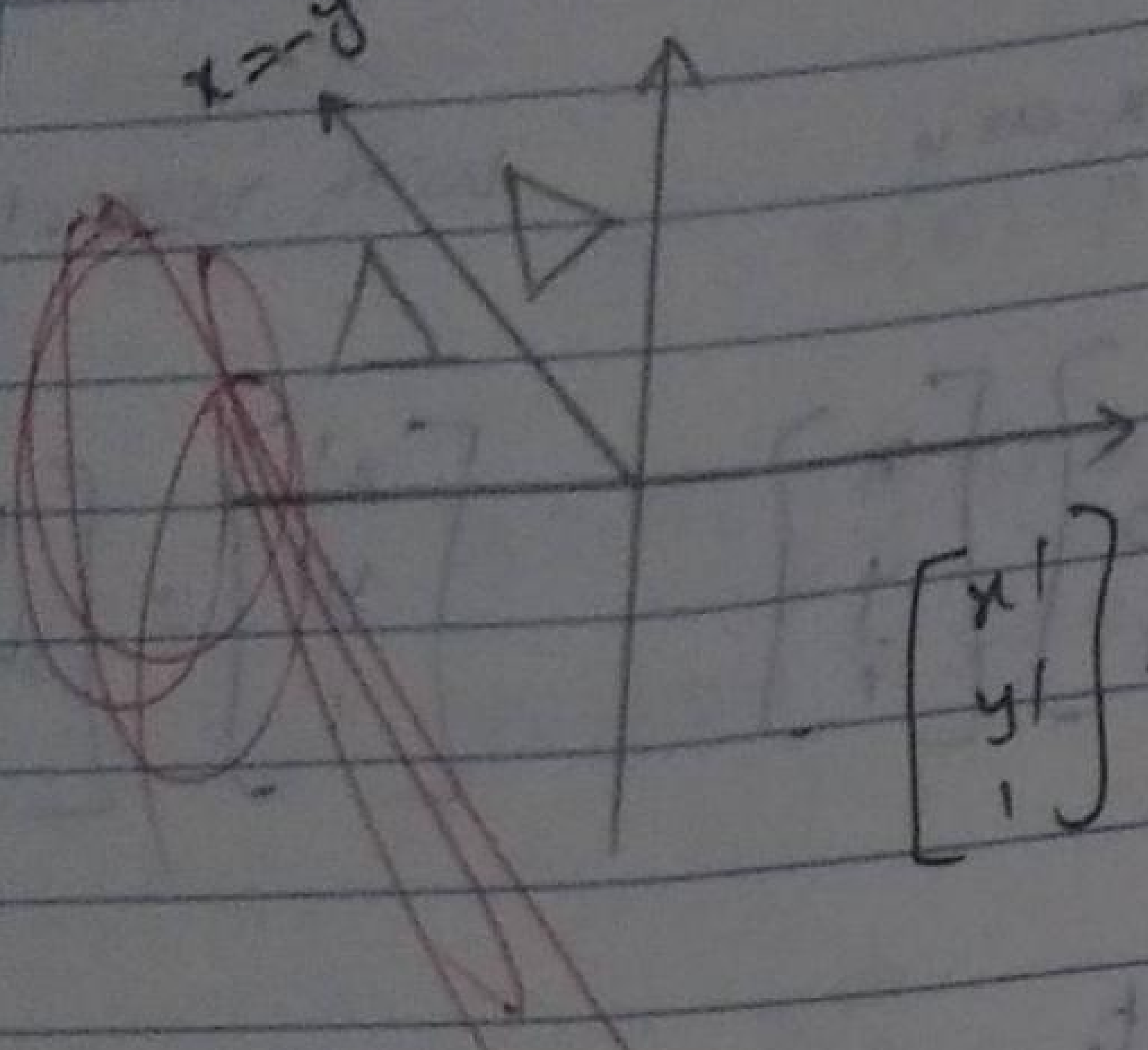
$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

$x' = -x$

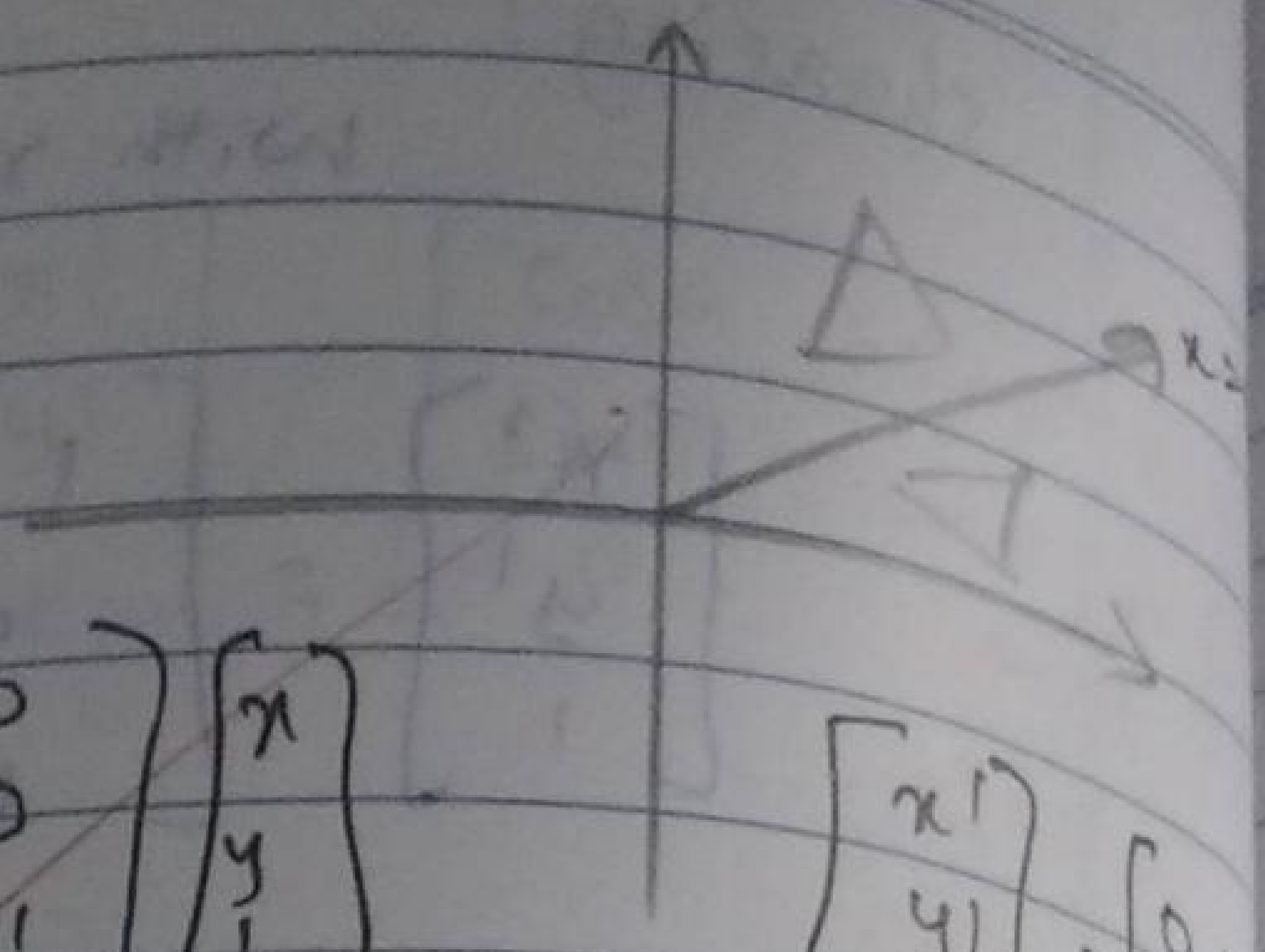
$y' = -y$

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

x



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



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

11. a) (ii) Recall the various methods used in text attribute.

(i) setTextFont (tf) → define the font
(ii) Set Text Color Index(cl) - color for the font
(iii) set character height (ch) - size of character
(iv) set character Expansion Factor (Ef) - character expan
(v) setTextpath (tp) → left, right, up or down
(vi) set Text alignment (ta) - vertical or horizontal
(vii) set character upvector (uv) - dimension
(viii) set Text precision (tpr) - precision for the text

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P.J	
Name and signature of Hall Supdt. with Date	

KONGU ENGINEERING COLLEGE

PERUNDURAI ERODE - 638 060.

(Autonomous)

Estd : 1984

TÜV SÜD ISO 9001

Name of the Student	R.M. SREENITHI	Register No.	1 6 C S R 2 0 0
Programme	B.E	Branch & Semester	CSE - VI
Course Code and Name	14CSC61 - GRAPHICS AND MULTIMEDIA	Date	20.2.19
		No. of Pages Used	6

MARKS TO BE FILLED IN BY THE EXAMINER

PART - A		PART - B			Grand Total Max. Marks : 50
Question No.	Max Marks : 2	Question No.		Max Marks : 10	
1	2	11	i)	2	
2	2		ii)	1	
3	2	12	i)	6	26/50
4	0		ii)		52%
5	2	13	i)	9	
6	–		ii)	1	R.M. Sreenithi
7	–	14	i)		
8	0		ii)		
9	0				
10	–				
TOTAL	8	TOTAL		18	

Total marks in words : Five Two

INSTRUCTION TO THE CANDIDATE

1. Check the Question Paper, Programme, Course Code, Branch Name etc., before answering the questions.
2. Use both sides of the paper for answering questions.
3. POSSESSION OF ANY INCRIMINATING MATERIAL AND MALPRACTICE OF ANY NATURE IS PUNISHABLE AS PER RULES.

R. Manjula Devi
Name of the Examiner

20/2/19
Signature of the Examiner with Date

PART-A

1. Applications of computer graphics:
i) Computer Aided Design
ii) Presentation graphics
iii) Computer Art
iv) Entertainment
v) Education and training
vi) Virtualisation
vii) Image Processing
viii) Graphical User Interface

2 2. Bitmap: for the computer graphics systems, one bit per pixel on the screen in the frame buffer.
Pixel map: for the graphics systems, multiple bit per pixel for the screen in the frame buffer.

2 3. Interactive Input devices:
i) keyboard
ii) Mouse
iii) Joy sticks
iv) Image scanner.

9. Traversal is defined as either the forward tracking or backwar tracking of the beam/model/input given.

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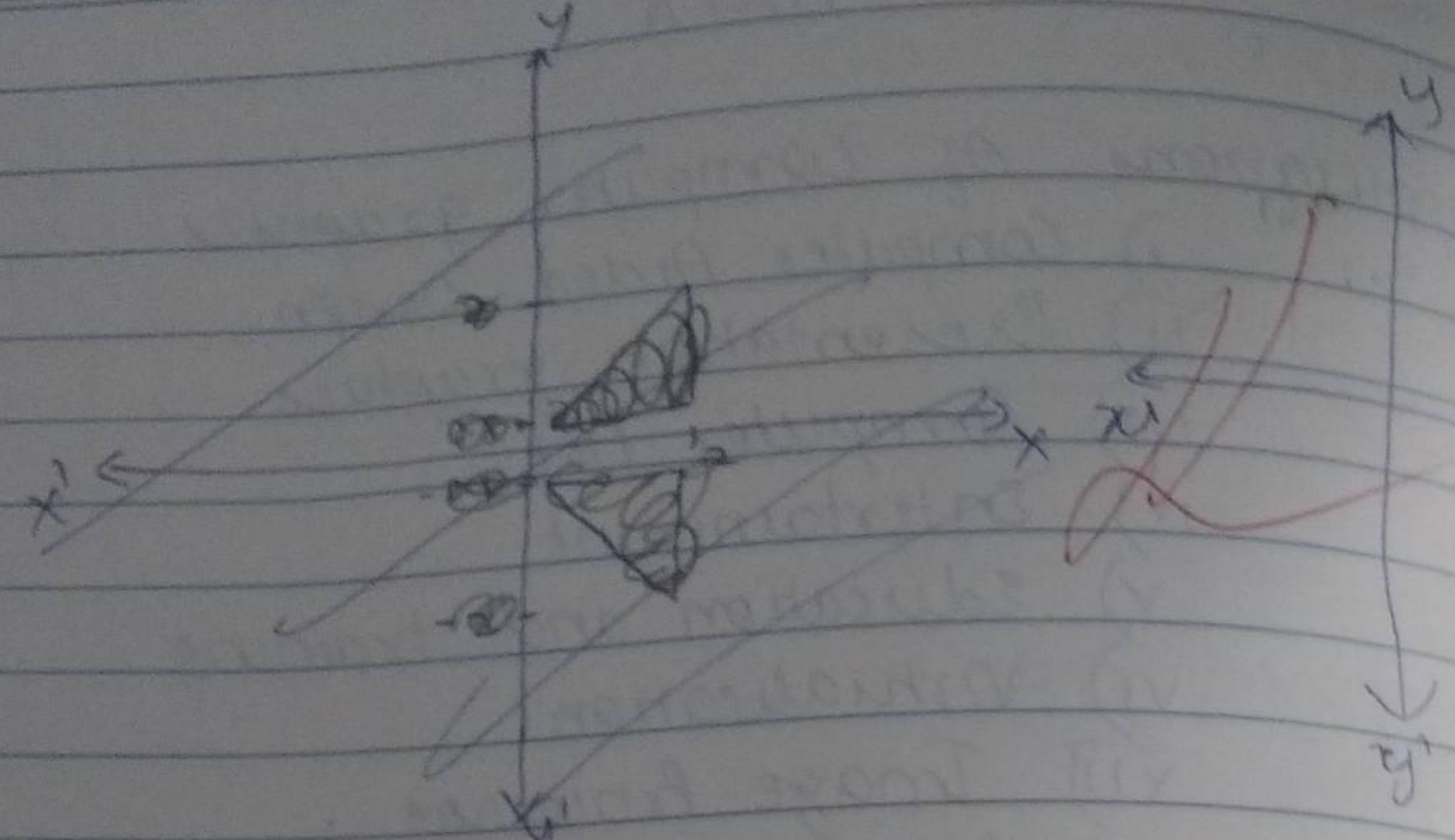
8.



5. The purpose of set interior colour index is to manually set the color of the pixel by the user and set interior style is to give style of font/width by the u

PART-B

Inputs:

11. (0, 0) + (4, 6)

$y = mx + c$ $(x_k, y_k) = (0, 0)$

when decision parameter

$P_k = 2\Delta y - \Delta x = 2 \times 6 - 4 = 12 - 4 = 8 > 0$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 0}{4 - 0} = \frac{6}{4} = \frac{\Delta y}{\Delta x}$

$\therefore \Delta y = 6, \Delta x = 4$

If $P_k \leq 0$, then (x_k+1, y_k) $P_{k+1} = P_k + 2\Delta y$

else

$P_k \geq 0$, then (x_k+1, y_k+1) $P_{k+1} = P_k + 2\Delta y - 2\Delta x$

At k=0

$P_0 = 2\Delta y - \Delta x = 8 > 0$

then

$(x_k+1, y_k+1) = (5, 7)$

At k=1 $P_{k+1} = 8 + 2(6) = 8 + 12 = 16 > 0$

-4

then

$(x_k+1, y_k+1) = (6, 8)$

At k=2 $P_{k+1} = 16 + 2(6) - 4$

$= 16 + 8 = 25 > 0$

then

At k=3 $P_{k+1} = 25 + 8 = 33 > 0$

12 - 8 = 4

8 - 12 (4, 5)

8 - 12

-12 - 2(4)

-12

-16

P < 0

8 - 8 - 12 (1, 1)

-12 < 0

-12 - 8 - 12

-8 (2, 2)

-8 - 8 - 12

1, 0

2, 0

3, 0

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At $k=0$ $(0,0)$

$P_0 = 2\Delta y - \Delta x$

$= 2(6) - 4 = 8 > 0$

then (x_{k+1}, y_{k+1})

$P_{k+1} = P_1 = P_0 + 2\Delta y - \Delta x$

$= 8 + 2(6) - 4$

$= 8 + 8 = 16 > 0$

then $(x_{k+1}, y_{k+1}) = ($

$P_{k+1} = P_2 = P_1 + 2\Delta y - \Delta x$

$= 16 + 8$

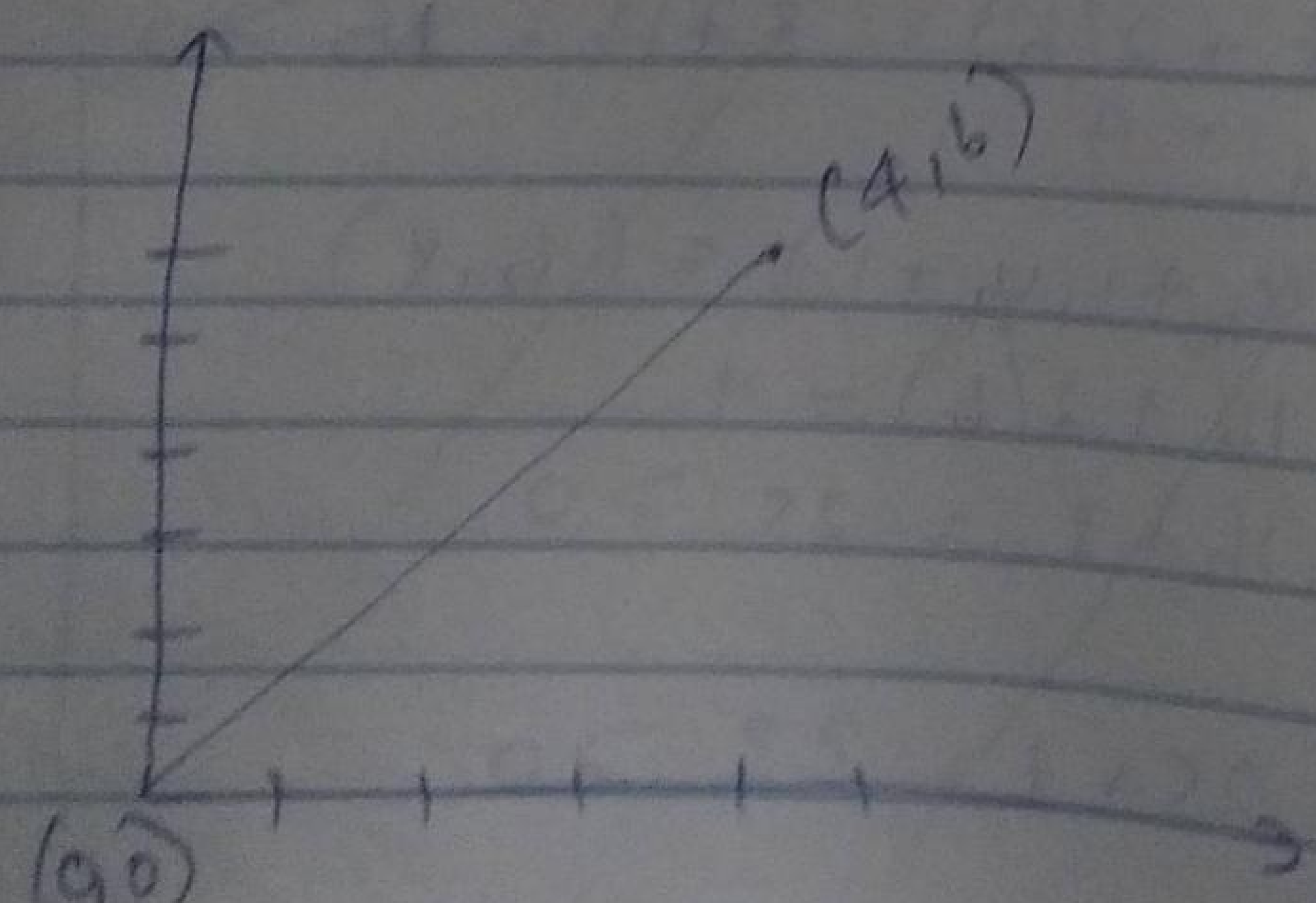
$= 24 > 0$

then $(x_{k+1}, y_{k+1}) = (3$

$P_{k+1} = P_3 = P_2 + 2\Delta y - \Delta x$

$= 24 + 8$

$= 32 > 0$



1 a) ii) Various methods in text attribute:
I) text size
II) text color
III) ~~text~~ font
IV) text Bold, Italic and underline
V) text space and indentation.
VI) text ~~case~~ case sensitive.
VII) text width

I) text size: ~~ranging~~ ~~of~~ Size of texts can be changed ranging from 4 to some limit

II) text color: Color of the text can also be changed using RGB color method.

III) font: The font style can be changed with various types of style are available in graphics

IV) Text Bold, Italic and underline:
The mode of text to be visible or for highlighting can also be changed.

V) Text Indentation:
Text spacing / indentation is also available in the computer graphics

VI) Text case-sensitive:
It can be either in upper-case or in lower case.

VII) Text width:
There is a option for changing the width of the text also

13. a) Basic Concepts of 2D-geometrical transformations are:

i) x and y axis
ii) translation
iii) Scaling
iv) Rotation

other concepts are
i) Shearing
ii) reflection

i) translation:
when (x, y) is changed ~~[illegible]~~ to (x', y') then it is represented as
(t_x, t_y)

$x' = x + t_x$
$y' = y + t_y$

The decision parameter is changed as P to P'

$P' = P + T$

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} t_x \\ t_y \end{bmatrix} + \begin{bmatrix} x \\ y \end{bmatrix}$$

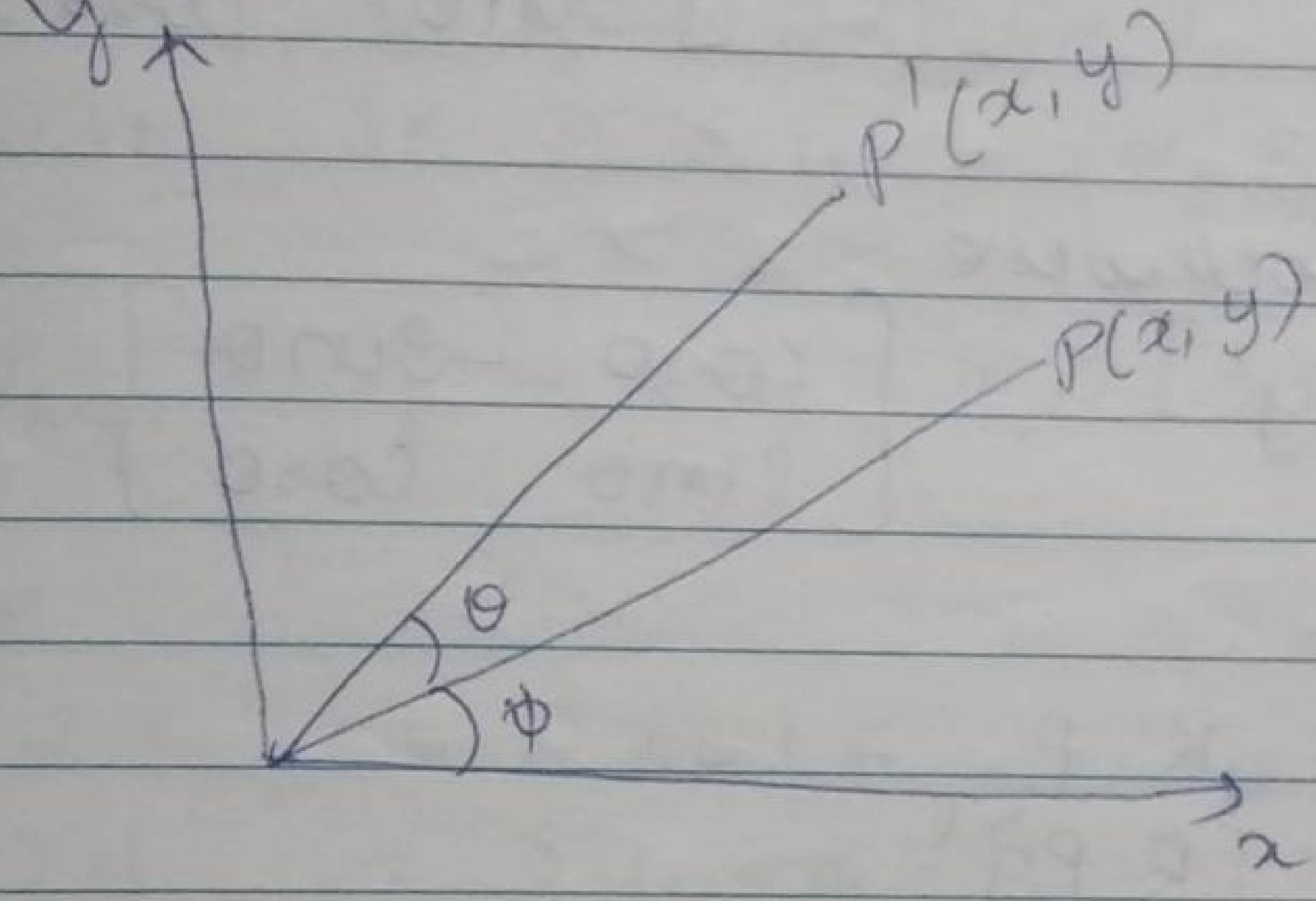
ii) Scaling:
It is represented as S_x, S_y and maybe maximum or Minimum Scal

$x' = x \cdot Sx$
$y' = y \cdot Sy$

and decision parameter is converted from P to P'.

$$\begin{bmatrix} x' & y' \end{bmatrix} = \begin{bmatrix} S_x & 0 \\ 0 & S_y \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix}$$

iii) Rotation:



$$\cos(\phi + \theta) = \frac{x'}{r}$$

$$x' = r \cos(\phi + \theta)$$

$$\sin(\phi + \theta) = \frac{y'}{r}$$

$$y' = r \sin(\phi + \theta)$$

$$x' = \cos\phi \cos\theta - \sin\phi \sin\theta$$
$$y' = \sin\phi \cos\theta + \cos\phi \sin\theta$$

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$\therefore x' = x\cos\theta - y\sin\theta$
$y' = x\sin\theta + y\cos\theta$

and $p' = R.P$

In Rotation it is either anticlockwise or clockwise

In clockwise,

$$p'[x', y'] = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} . \begin{bmatrix} x \\ y \end{bmatrix}$$

In anticlockwise

$$[x' \; y'] = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} . \begin{bmatrix} x \\ y \end{bmatrix}$$

$\therefore p' = R.p$
$p'^T = [R.P]^T$
$p'^T = p^T . R^T$

12.a) Midpoint Circle Algorithm

Input radius $r = 4$

Circle centre $(x_c, y_c) = (4, 5)$

Decision Parameter

$$P_0 = 1 - r$$

At each x_k, starting at $k = 0$,

the next pt we plot for (x_k+1, y_k)

if $P_k < 0$ is

$$P_{k+1} = P_k + 2x_{k+1} + 1$$

otherwise if $P_k \geq 0$, (x_k+1, y_k-1)

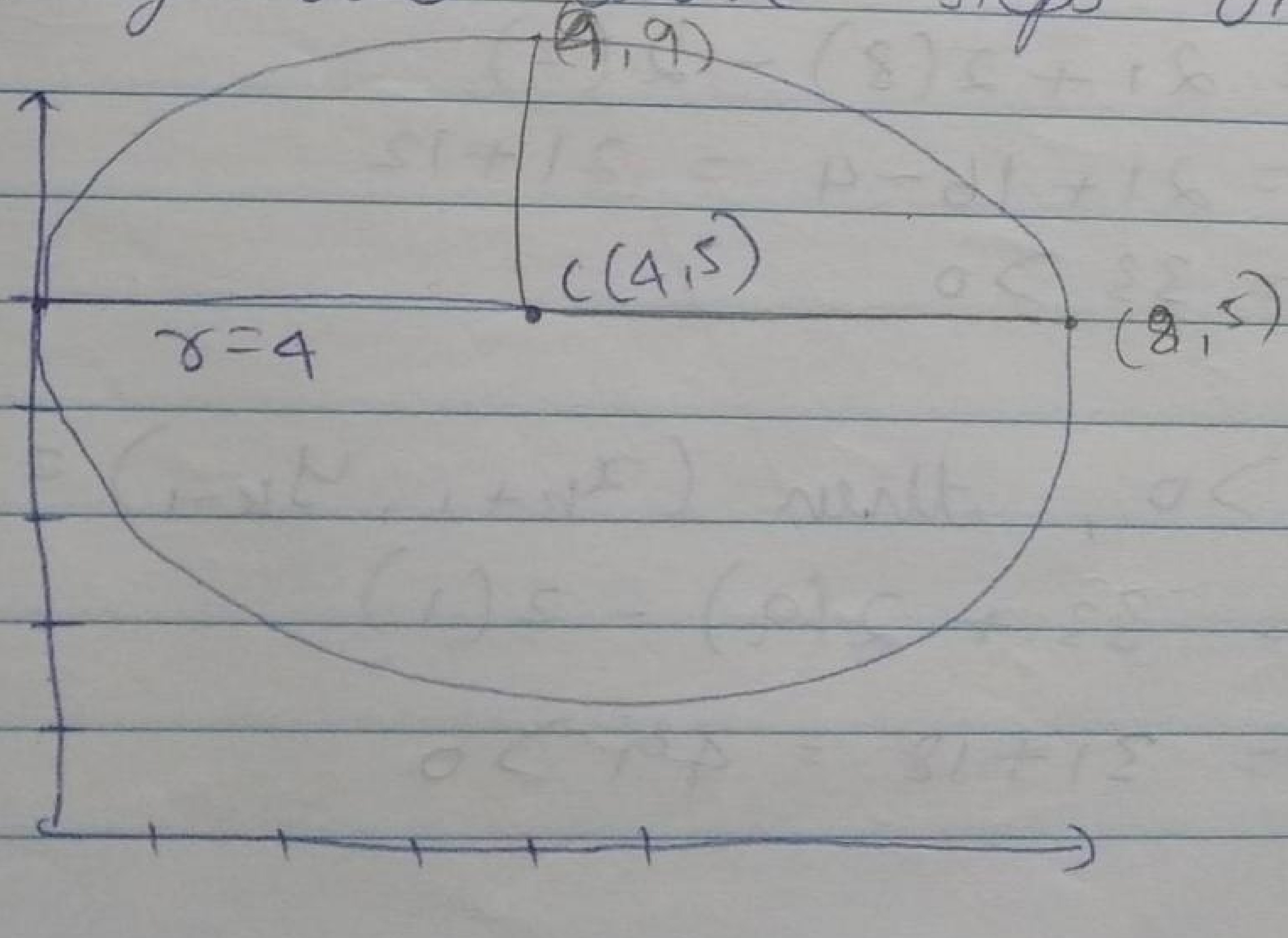
$$P_{k+1} = P_k + 2x_{k+1} + 1 - 2(y_k - 1)$$

where

$$1 + 2x_{k+1} = 2x_k + 2$$

$$2y_{k-1} = 2y_k - 2$$

Repeating the above steps until $x \geq y$



~~At k=0~~
$(x_k, y_k) = (4,5)$

$P_0 = 1-4 = -3 < 0 \quad (T)$

At k=1 $(x_k+1, y_k) = (5,5)$ $\boxed{x_{k+1} = x_k+1}$

$P_{k+1} = -3 + 2(5) + 1$
$= -3 + 10 + 1$
$= 11 - 3 = 8$

At k=2
$P_{k+1} > 0$, then $(x_{k+1}, y_{k-1}) = (6,4)$
$P_{k+1} = -8 + 2(6) + 1 - 2(4)$
$= -8 + 12 + 1 - 8$
$= 13 > 0$

At k=3
$P_{k+1} > 0$, then $(x_{k+1}, y_{k-1}) = (7,3)$
$P_{k+1} = 13 + 2(7) - 2(3)$
$= 13 + 14 - 6 = 21 > 0$

At k=4 $P_{k+1} > 0$, then $(x_{k+1}, y_{k-1}) = (8,2)$

$P_{k+1} = 21 + 2(8) - 2(2)$
$= 21 + 16 - 4 = 21 + 12$
$= 33 > 0$

k=5

$P_{k+1} > 0$, then $(x_{k+1}, y_{k-1}) = (9,1)$
$P_{k+1} = 33 + 2(9) - 2(1)$
$= 31 + 18 = 49 > 0$

At $k=6$

$P_{k+1} > 0$, $(x_k+1, y_k-1) = (10, 0)$

$P_{k+1} = 49 + 2(10)$

$= 69 > 0$

(9,5) (9,5)

2

$2+14-6$

10

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DEPT. OF COMPUTER SCIENCE & ENGG.
KONGU ENGINEERING COLLEGE,
THOPPUPALAYAM (PO)
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PN	
Name and signature of Hall Supdt. with Date	

Estd : 1984

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Name of the Student	T. Soundar	Register No.	1	6	C	S	R	1	9	5
Programme	BE	Branch & Semester	CSE - D VI - Semester							
Course Code and Name	14CSC61 Graphics and Multimedia	Date	20.2.19			No. of Pages Used	12			

MARKS TO BE FILLED IN BY THE EXAMINER

PART - A		PART - B			Grand Total Max. Marks : 50
Question No.	Max Marks : 2	Question No.		Max Marks : 10	
1	2	11	i)	4	19/50
2	–		ii)		38%
3	–	12	i)	1	
4	2		ii)		
5	–	13	i)	8	
6	–		ii)		
7	–	14	i)		verified by, T.
8	2		ii)		
9	–				
10	–				
TOTAL	6	TOTAL		13	

Total marks in words : Three Eight

INSTRUCTION TO THE CANDIDATE

1. Check the Question Paper, Programme, Course Code, Branch Name etc., before answering the questions.
2. Use both sides of the paper for answering questions.
3. POSSESSION OF ANY INCRIMINATING MATERIAL AND MALPRACTICE OF ANY NATURE IS PUNISHABLE AS PER RULES.

20/2/19
Signature of the Examiner with Date

R. Manjula
Name of the Examiner

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Part-A

1. Applications of Computer Graphics:

* Computer Aided Designing for Eng... architectural system.
* Computer Art
* Graphical User Interface
* Entertainment
* Education and Training
* Image processing
* Presentation graphics

4. DDA :

$(x_0, y_0) = (1,2)$.

$\Delta x = 3-1 = 2$

$\Delta y = 4-2 = 2$

$2\Delta y = 4$

$2\Delta y - 2\Delta x = 4-4 = 0$.

$2\Delta y - \Delta x = 4-2 = 2$.

$P_0 = 2\Delta y - \Delta x = 2$

$K=0$ $\therefore P_0 > 0 \Rightarrow x_{k+1} = x_k + 1$, $y_{k+1} = y_k + 1$

$x_1 = x_0 + 1 = 1+1 = 2$, $y_1 = 2+1 = 3$.

$P_k > 0$, $y_{k+1} = y_k - 1$

$P_{k+1} = P_k + 2\Delta y - \Delta x$.

$= 1 + 2(x_k+1) - (y_k^2 - (y_k-1)^2) + (y_k - y_k + 1)$

$P_1 = P_0 + 2$

$= 2+2 = 4$.

Point is (2, 3)

$= 1 + 2(x_k+1) - (y_k^2 - y_k^2 - 1 + 2y_k) + 1$

$= 1 + 2(x_k+1) + 1 - 2y_k + 1 = 1 + 2(x_k+1) + 2 - 2(y_k)$

8

10

$k = 1$ $\quad P_1 > 0. \Rightarrow x_2 = x_1 + 1 \qquad y_2 = y_1 + 1$

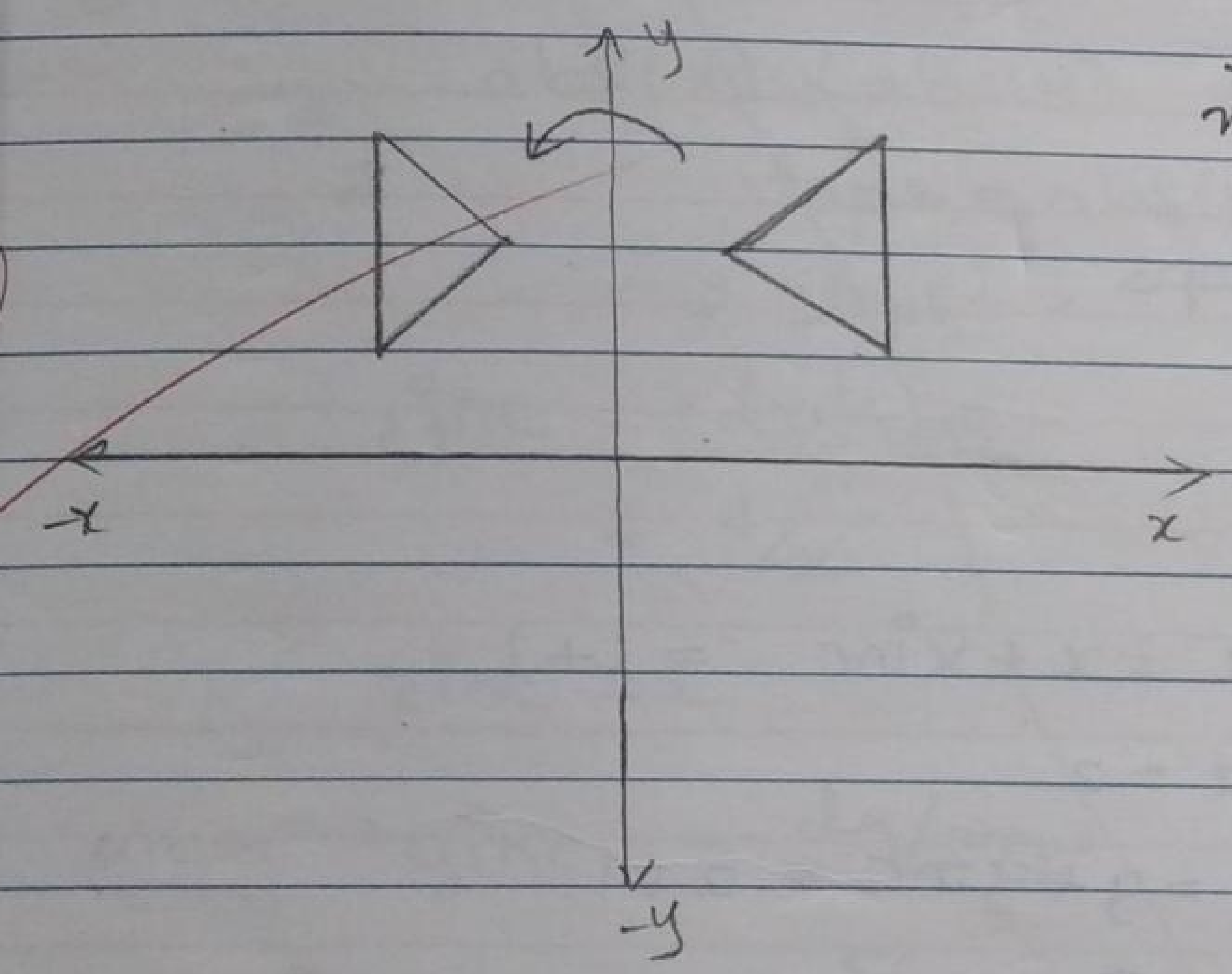
$x_2 = 2 + 1 = 3 \qquad y_2 = 3 + 1 = 4$

$P_2 = P_1 + 2\Delta y - \Delta x$

$P_2 = 4 + 2 = 6.$ Point is $(3, 4)$.

K	P_K	Points.
0	2	(1, 2)
1	4	(2, 3).
	6	(3, 4).

8 Reflection:



$x' = -x$
$y' = y.$

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

10 Methods for editing structure:

i) Translation
ii) Reflection
iii) Scaling
iv) Shearing
v) Rotation.

4. DDA

~~xx~~: $(x_1, y_1) = (1, 2)$

$(x_2, y_2) = (3, 4)$

$dx = 3 - 1 = 2$

$dy = 4 - 2 = 2$

$x = x_1 \Rightarrow x = 1$

$y = y_1 \Rightarrow y = 2.$

abs(x) < abs(y)

steps = abs(y)

$\Rightarrow$ steps = 2.

xinc = dx/steps.

= 2/2

xinc = 1

yinc = dy/steps

= 2/2

yinc = 1

k = 0. $\Rightarrow$ 0 < 2 x = x + xinc = 1 + 1

x = 2

y = y + yinc = 2 + 1

y = 3

(2, 3)

k = 1 $\Rightarrow$ 1 < 2

x = x + xinc = 2 + 1

x = 3

y = y + yinc = 3 + 1

y = 4.

(3, 4)

k = 2 $\Rightarrow$ 2 < 2

exit

intermediate points

(1, 2)

(2, 3)

(3, 4)

Part - B.

11 b) (i) DDA line Drawing Algorithm:

$(x_1, y_1) = (1, 2)$
$(x_2, y_2) = (5, 7)$

$dx = 5 - 1 = 4$
$dy = 7 - 2 = 5$
$x = x_1 \Rightarrow x = 1$
$y = y_1 \Rightarrow y = 2.$

abs(x) < abs(y) $\Rightarrow$ 1 < 2
steps = abs(y)
$\Rightarrow$ steps = 2

xinc = dx/steps
$= 4/2$

xinc = 2

yinc = dy/steps.
$= 5/2$

yinc = 2.5

K = 0 $\Rightarrow$ 0 < 4 , x = x + xinc = 1+2
x = 3
y = y + yinc = 2+2.5
y = 4.5
(3, 4.5)

$K=1, \quad 1<4$

$x = x + xinc = 3+2$

$x = 5$

$y = y + yinc = 4.5 + 2.5$

$y = 7$

Part - B

12 .a) Midpoint Circle:

$(x_c, y_c) = (4, 5)$

$r = 4 \qquad (x_0, y_0) = (0, 0)$

$x = 0$

$y = r \Rightarrow y = 4.$

$P_0 = 1 - r.$

$P_0 = 1 - 4 = -3.$

$P_0 < 0, \quad x_{k+1} = x_k + 1 \Rightarrow x_1 = x_0 + 1$

$x_1 = 0 + 1$

$x_1 = 1$

$P_{k+1} = P_k + 1 + 2x_{k+1}$

$P_1 = P_0 + 1 + 2x_1$

$= -3 + 1 + 2$

$P_1 = 0$

$P_1 = 0$, lies on the circle.

13. a) 2D geometrical transformation:

i) Translation
ii) Rotation
iii) Scaling
iv) shearing
v) Reflection

Translation:

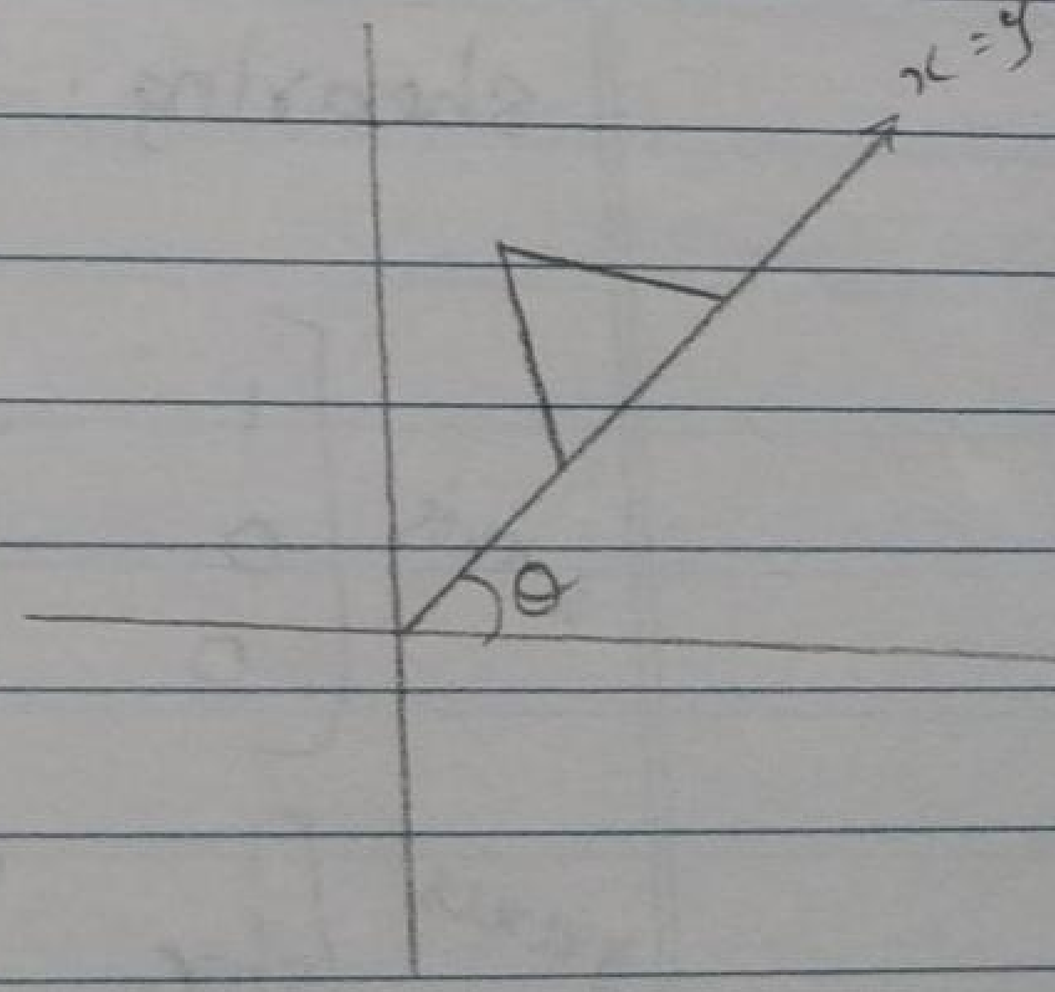
$x' = x + tx$
$y' = y + ty$.

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & tx \\ 0 & 1 & ty \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Rotation:

$x' = x\cos\theta - y\sin\theta$
$y' = x\sin\theta + y\cos\theta$.

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$



$x' = x_r + r\cos(\phi + \theta)$
$x' = x_r + r\cos\phi\cos\theta + r\sin\phi\sin\theta$.
$x' = x\cos\theta + y\sin\theta$

$$y' = y_r + r\sin(\phi + \theta)$$

$$y' = y_r + r\sin\phi\cos\theta + r\cos\phi\sin\theta$$

$$y' = y\cos\theta + x\sin\theta$$

scaling:

$$x' = x.S_x$$

$$y' = y.S_x.$$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}.$$

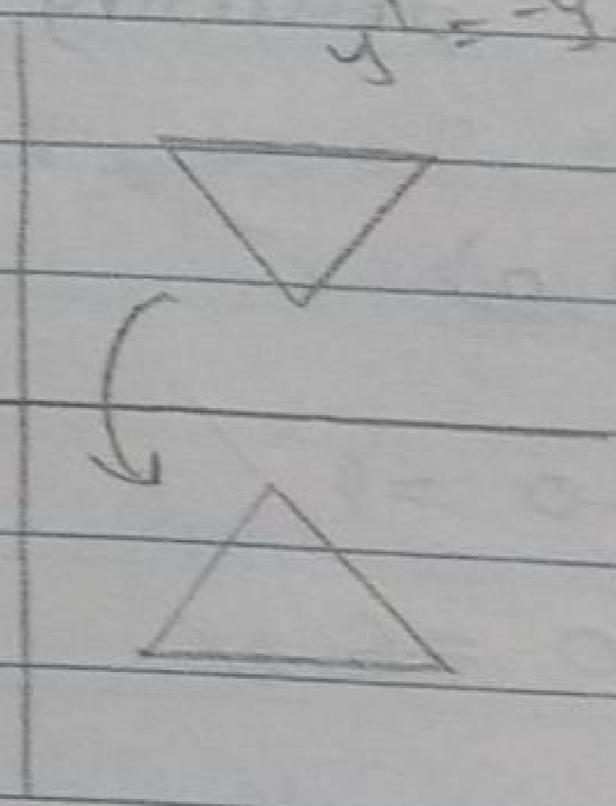
shearing:

x axis $\begin{bmatrix} 1 & sh_y & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \xrightarrow{\text{reference}} \begin{bmatrix} 1 & sh_y & sh_y . x_{ref} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

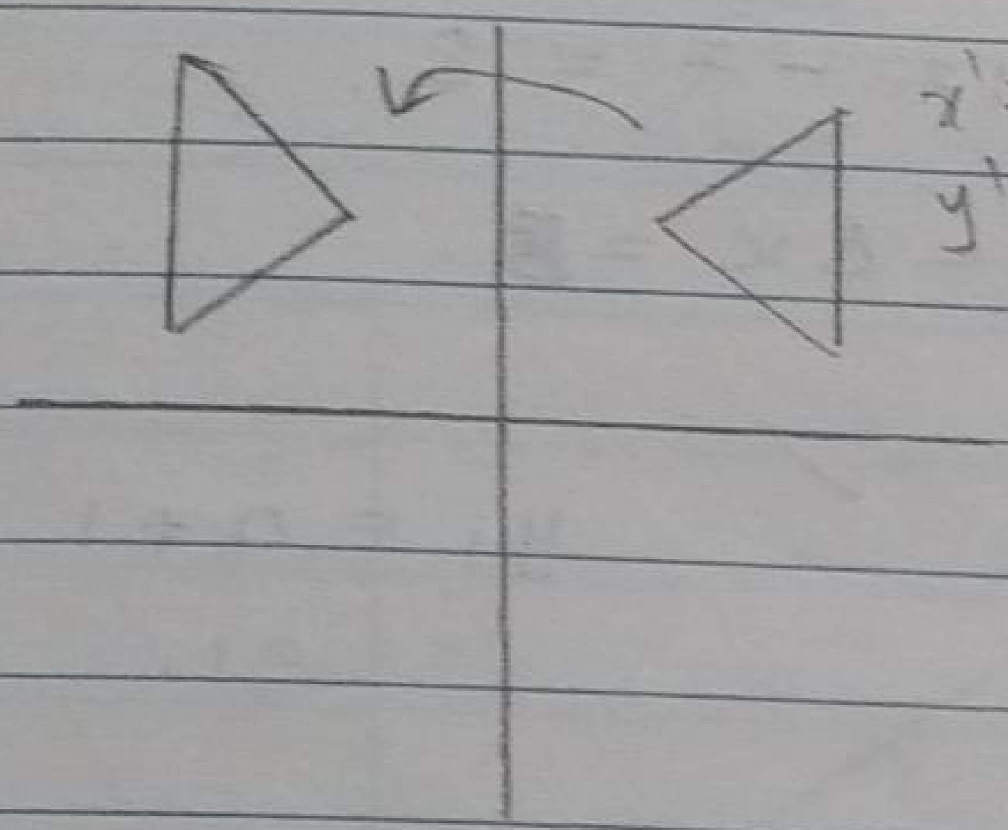
y axis $\begin{bmatrix} 1 & 0 & 0 \\ sh_x & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \xrightarrow{\text{reference}} \begin{bmatrix} 1 & 0 & 0 \\ sh_x & 1 & sh_x . y_{ref} \\ 0 & 0 & 1 \end{bmatrix}$

Reflection:

$x' = x$
$y' = -y$

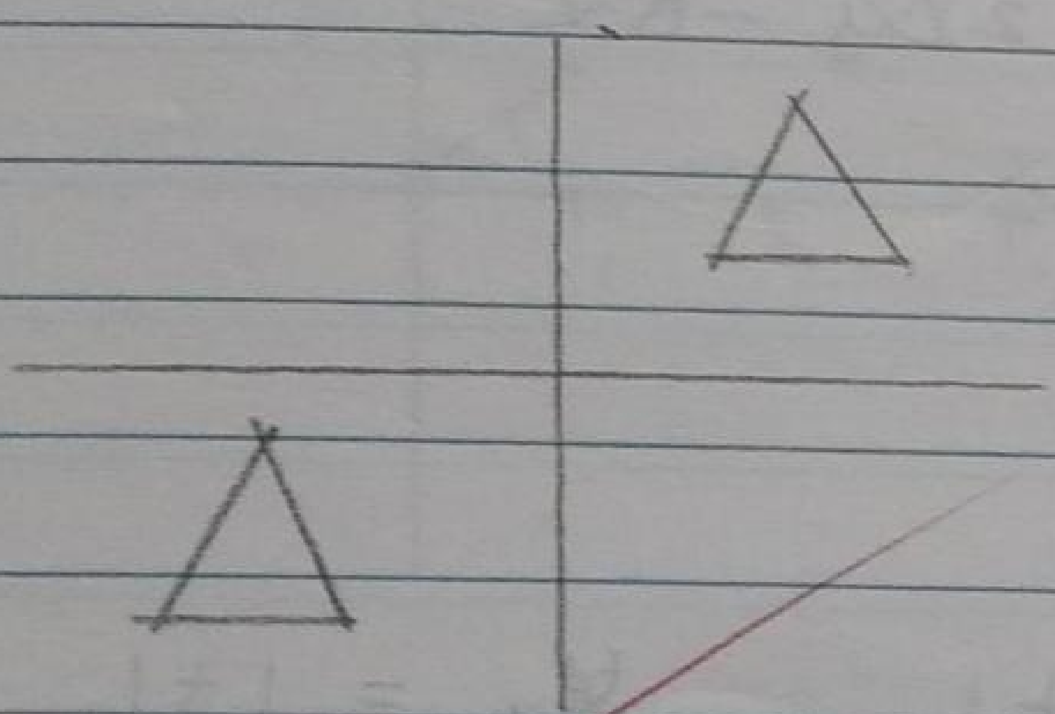


$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$



$x' = -x$
$y' = y$

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



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

$x' = -x$
$y' = -y$

8

11. a) (i) Breshom's line drawing algorithm:

$(x_0, y_0) = (0,0)$

$\Delta x = 4 - 0 = 4$

$\Delta y = 6 - 0 = 6$

$2\Delta y = 12$

$2\Delta y - \Delta x = 12 - 4 = 8.$

$P_0 = 2\Delta y - \Delta x = 8.$

$k = 0.$

$P_0 > 0$, $x_{k+1} = x_k + 1$ $\quad y_1 = 0 + 1$

$x_1 = 0 + 1$ $\quad = 1.$

$= 1$

$P_{k+1} = P_k + 2\Delta y - \Delta x$

$P_1 = P_0 + 8$

$= 8 + 8$

$= 16$

$k = 1$ $\quad P_1 > 0$, $x_2 = 1 + 1$ $\quad y_2 = 1 + 1$

$= 2$ $\quad y_2 = 2$

$P_2 = 16 + 8$

$= 24$

$k = 2$ $\quad P_2 > 0$

$x_3 = 3$ $\quad y_2 = 3$

$P_3 = 24 + 8$

$= 32$

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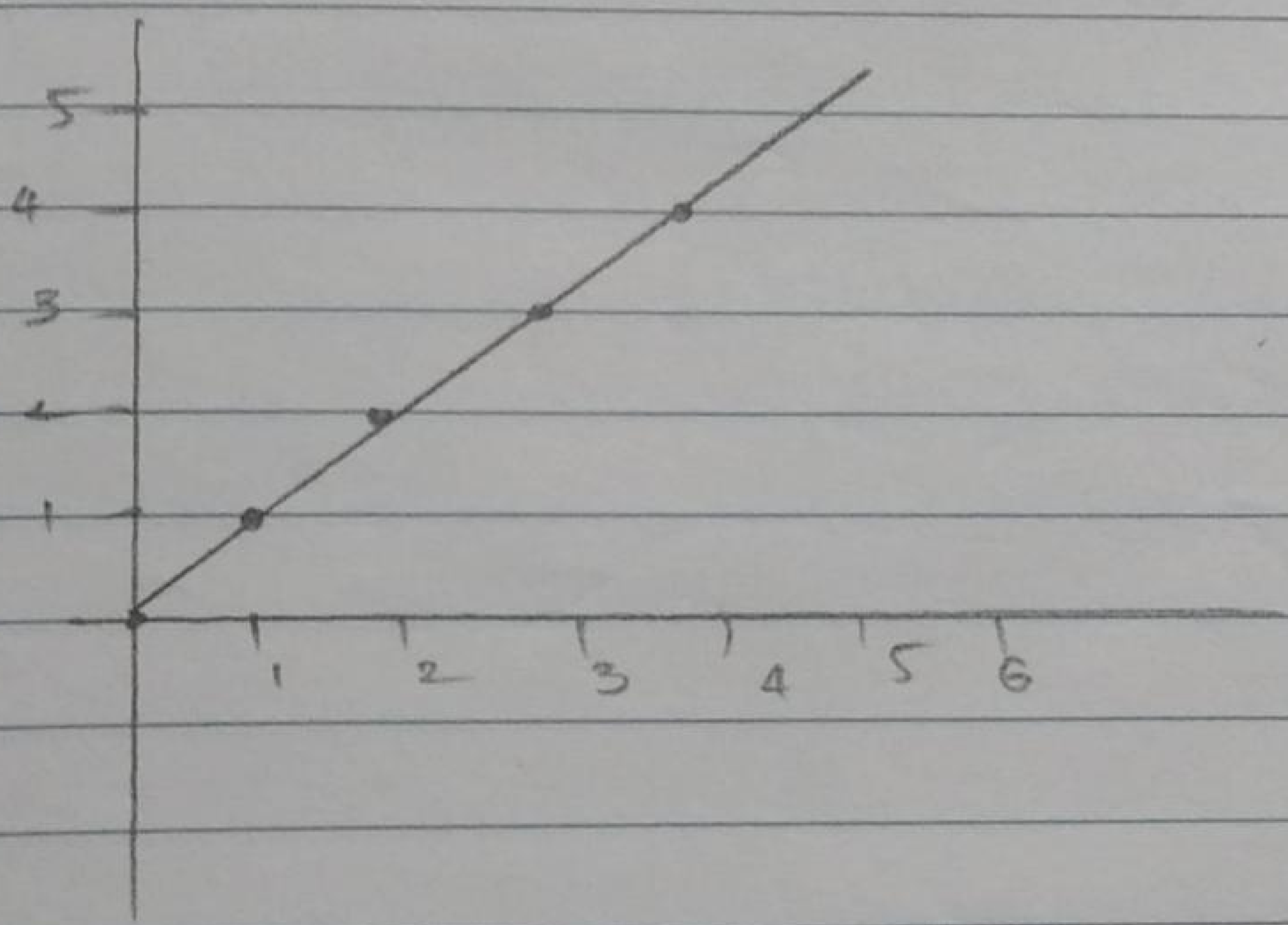
$k = 3$

$P_3 > 0$ $\quad x_3 = 4 \quad y_3 = 4$

$P_3 = 32 + 8$

$= 40.$

k	P_{k+1}	Points.
0	16	(1, 1)
1	24	(2, 2)
2	32	(3, 3)
3	40.	(4, 4).



Continuous Assesment - I

14CSC61 Graphics and Multimedia.

Answer key

Part-A

Answer the following:

1. Applications (any 4) (2)

* Computer aided design
* presentation graphics
* computer art
* Entertainment
* Education & training
* Visualization
* Image processing
* Graphical user interface

2.

BIT MAP	PIXEL MAP
For black and white display one bit information is stored in buffer this storage is called BIT map	For colour Images more than one bit is stored in a buffer this storage is called pixel map.

3. Input devices.

keyboard
mouse
trace ball
digitizer.

4. Determine the intermediate points - DDA

(1, 2) (3, 4)

$$m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{4-2}{3-1} = 2/2 = 1$$

$m \Rightarrow \leq 1$ +ve slope

$x_{k+1} = x_k + 1$

$y_{k+1} = m + y_k$

$\Rightarrow$ (i) $1+1 = 2 \Rightarrow x_{k+1}$
$1+2 = 3 \Rightarrow y_{k+1}$

$\Rightarrow$ (ii) $2+1 \Rightarrow 3 \Rightarrow x_{k+1}$
$3+1 \Rightarrow 4 \Rightarrow y_{k+1}$

(1, 2) (2, 3) (3, 4)

↓
intermediate pt.

5. Set interior colour index (fc)

To choose an interior colour with the fill colour parameter (fc)

Set interiorstyle (fs)

To fill the interior portion of an object with particular fill style ie hollow, pattern or solid. with the fill style parameter (fs)

6. Aliasing: Distortion of information due to low-frequency sampling

Anti-aliasing: to compensate the under sampling.

7. $sh_x = 1/2$

$y_{ref} = -1$

$y' = y$

$$\begin{bmatrix} 1 & sh_x & -sh_x \cdot y_{ref} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$= x' = x + sh_x(y - y_{ref})$

$y' = y$

pts (0,0) (0,1) (1,0) (1,1)

(i) (0,0)

$= x' = 0 + \frac{1}{2}(0-(-1))$

$= 0 + \frac{1}{2}(1)$

$= \frac{1}{2}$

$y' = 0$

$= (\frac{1}{2}, 0)$

(ii) (0,1)

$x' = 0 + \frac{1}{2}(1-(-1))$

$x' = 0 + \frac{1}{2}(2)$

$x' = 1$

$y' = 1$ (1,1)

(iii) (1,0)

$x' = 1 + \frac{1}{2}(0-(-1))$

$= 1 + \frac{1}{2}$

$= 3/2$

$y' = 0$

$(3/2, 0)$

(iv) (1,1)

$x' = 1 + \frac{1}{2}(1-(-1))$

$= 1 + \frac{1}{2}(2)$

$= 2$

$y' = 1$

$= (2, 1)$

case(i) (0,0)

(0,0) ~~$x' = 0 + \frac{1}{2}(0+1)$~~

(0,1) ~~$= \frac{1}{2}(+1)$~~

(1,0) $= +\frac{1}{2}$

(1,1) $y' = 0$

$= (\frac{1}{2}, 0)$

(case ii)

(0,1)

$x' = (0 + \frac{1}{2}(0+1))$ $\frac{1}{2}$

$y' = 1$

$= (\cancel{\frac{1}{2}}, 1)$

case(iii)

(1,0)

$x' = 1 + \frac{1}{2}(1+1)$

$x' = 1 + \frac{1}{2}(2)$

$y' = 0$

(2, 0)

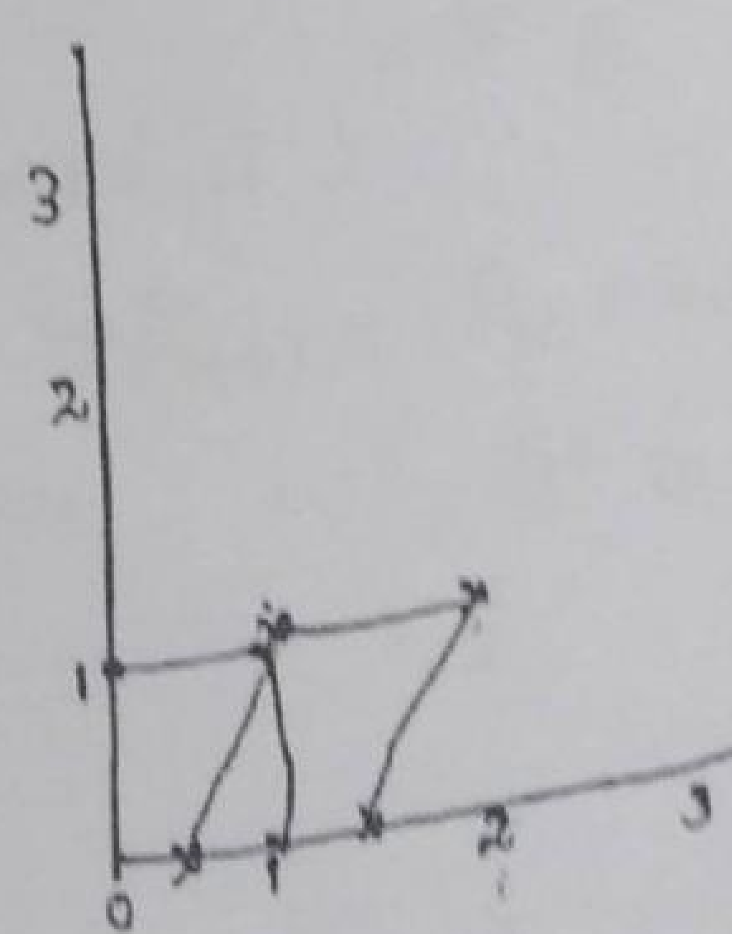
(case iv)

~~(1,1)~~ $\Rightarrow 0 + \frac{1}{2}(1+1)$

$x' = 1$

$y' = 1$

(1,1)



Part - B

Answer the following.

11) a) Bresenham's Line Drawing Algorithm

Starting point (0,0)

Ending point (4,6)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-0}{4-0} = 6/4 = 3/2 = 1.5$$

k	P_k	x_{k+1}	y_{k+1}	
0	1	1	1	(1,1)
1	3	2	2	(2,2)
2	5	3	3	(3,3)
3	7	4	4	(4,4)

$P_0 = 2\Delta y - \Delta x$

$= 4 - 3$

$= 1$

$P_k < 0 = (x_k+1, y_k)$

$P_{k+1} = P_k + 2\Delta y$

$P_k > 0 = (x_{k+1}, y_{k+1})$

$P_{k+1} = P_k + 2\Delta y - 2\Delta x$

case i) $P_{k+1} = P_k + 2\Delta y - \Delta x$

$= 1 + 6 - 4$

$= 3$

case ii) $P_{k+1} = \cancel{1 + 2\Delta y}$

$3 + 6 - 4$

$= \cancel{-1+4}$

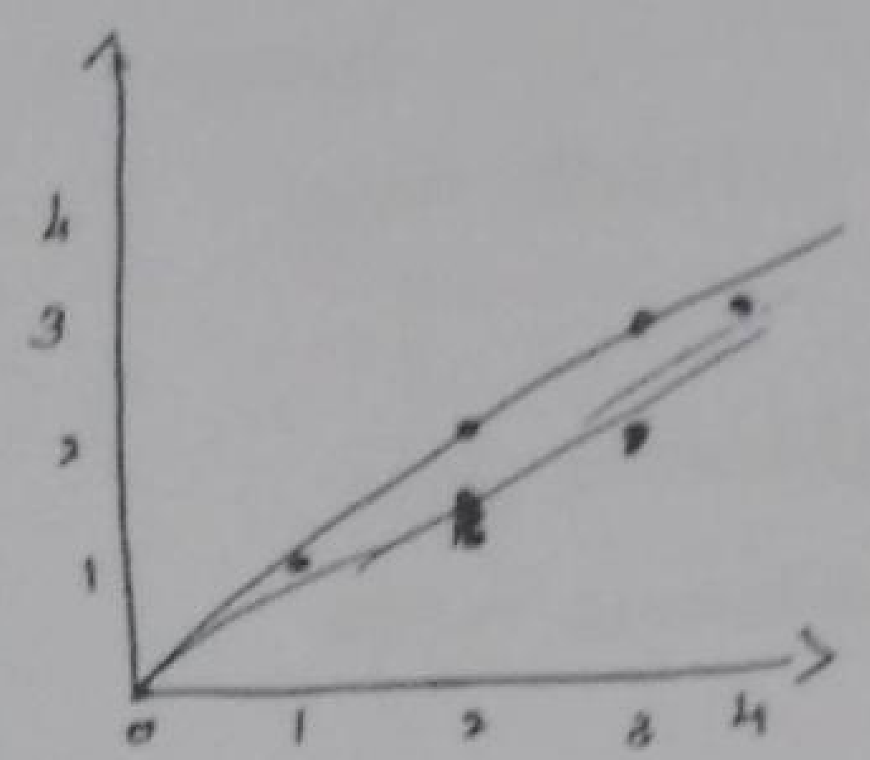
$= 5$

case (iii)

$P_{k+1} = P_k + 2\Delta y - 2\Delta x$

$= 5 + 6 - 4$

$= 7$



$P_0 = 2\Delta x - \Delta y$

$=$

$P_k > 0 = x_{k+1}$ as $x_k + 1 \rightarrow y_{k+1}$

$P_{k+1} = P_k + 2dx - 2dy$

$P_k < 0 = (x_{k+1}, y_k)$

$P_{k+1} = P_k + 2dx$

8. Reflection w.r.to y axis

Let the pt. of triangle be (1,1) (3,1) (4,3)

$x' = -x$

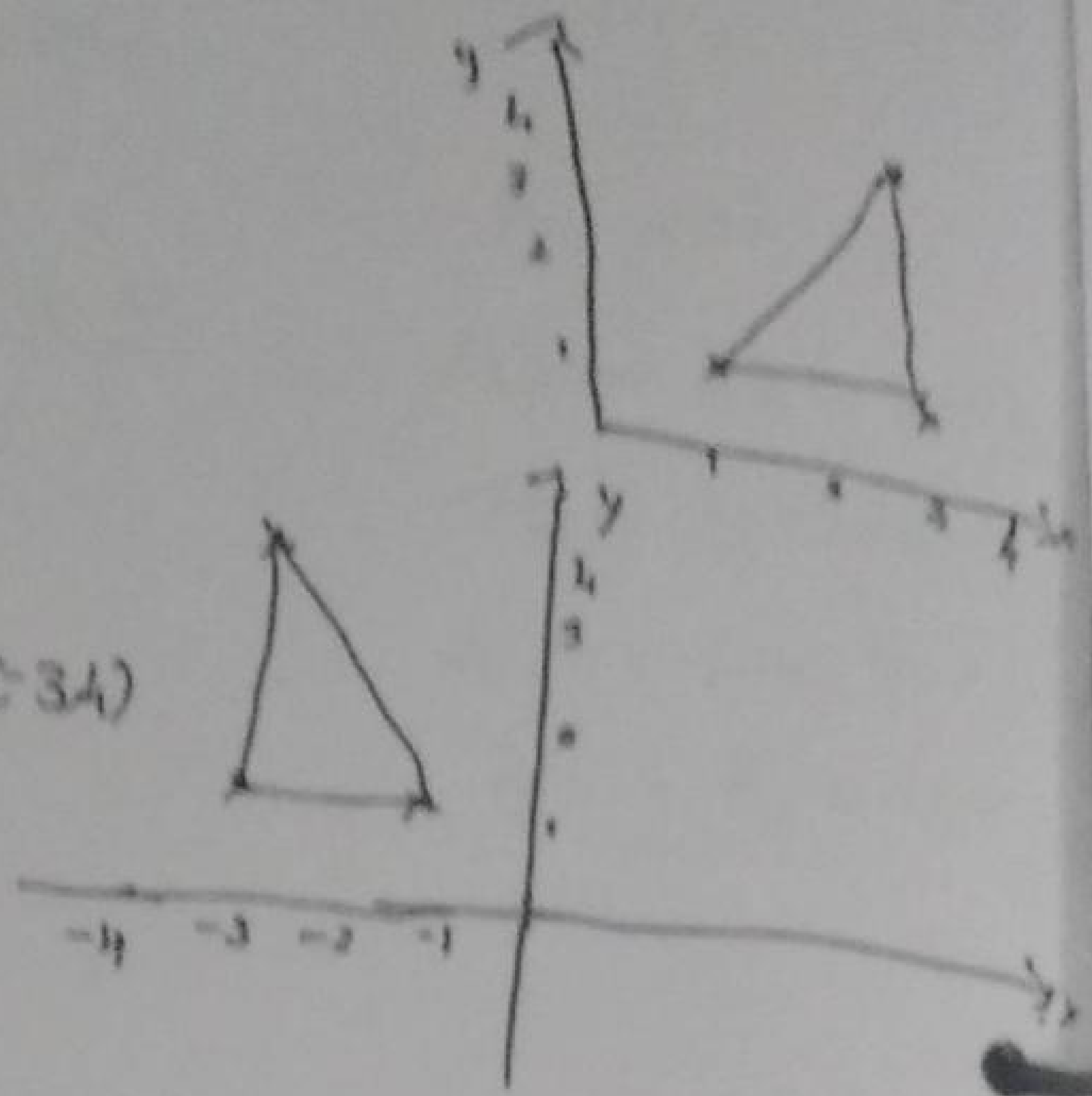
$y' = y$

(i) (1,1) (ii) (3,1) (iii) (4,3)

$x' = -1$ $x' = -3$ $x' = -4$

$y' = 1$ $y' = 1$ $y' = 4$

(-1,1)   (-3,1)   (-3,4)



9) Traversal:

Scaning the structure and sending the graphical output to a workstation is called traversal

10. Methods used for editing the structure:

1) append.

open structure (id)

⋮

close structure

open structure (id)

⋮

close structure (id)

2) Edit mode

set Edit (mode)

3) To insert

open structure (id)

set Edit mode (insert/replace)

⋮

close structure

To remove

Selet element pointer (No.)

delete element.

To copy

open structure (s))

copy all element from structure (id)

close structure;

Part-B

Answer the following.

11- a) Bresenham's line drawing algorithm.

(0,0) (4,6)

$m = \frac{\Delta y}{\Delta x} = \frac{6-0}{4-0} = 6/4 = 3/2 > 1$

$P_0 = 2\Delta x - \Delta y$

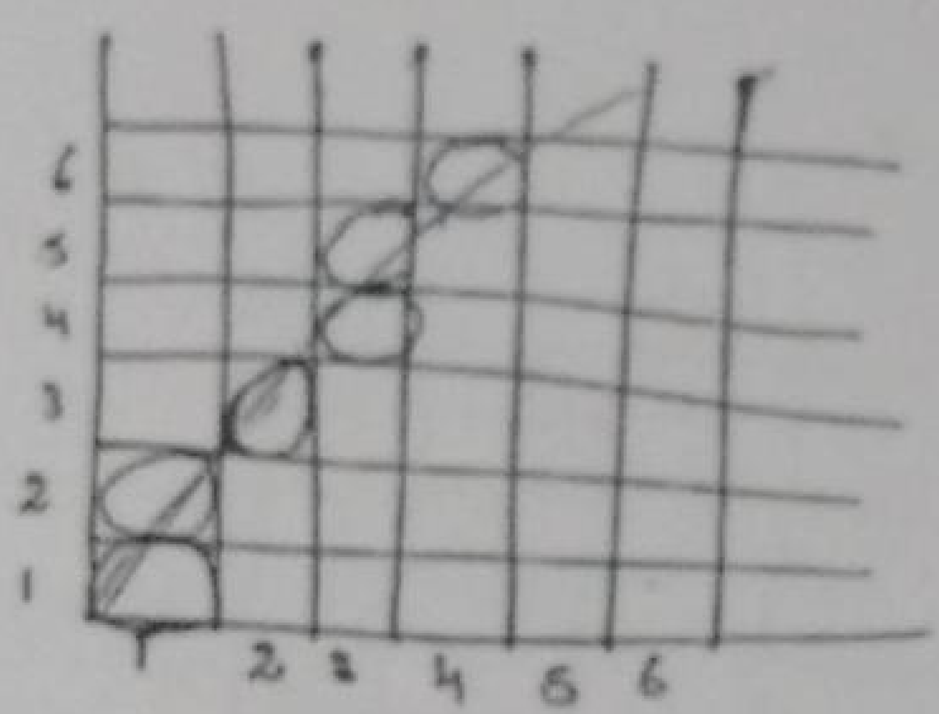
$P_k > 0 = (x_{k+1}, y_{k+1})$

$P_{k+1} = P_k + 2\Delta x - 2\Delta y$

$P_k < 0 = (x_k, y_{k+1})$

$P_{k+1} = P_k + 2\Delta x$

K	P_k	x_{k+1}	y_{k+1}	
0	1	1	1	(1,1)
1	-1	1	2	(1,2)
2	3	2	3	(2,3)
3	1	3	4	(3,4)
4	-1	3	5	(3,5)
5	3	4	6	(4,6)



11-(b)
(ii) Text Attributes

setTextFont (tf)

setTextColourIndex (tc) - colour code for text.

Set Character Expansion Factor (cw) - character width.

Set character Spacing (cs) -

Set Character Up Vector (upvect) - controls orientation of txt.

Set Textpath (tp)

Set Text Alignment (h,v)

Set Text precision (tpr)

11 b) DDA - Algorithm.

(1, 2) (5, 7)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-2}{5-1} = \frac{5}{4} > 1$$

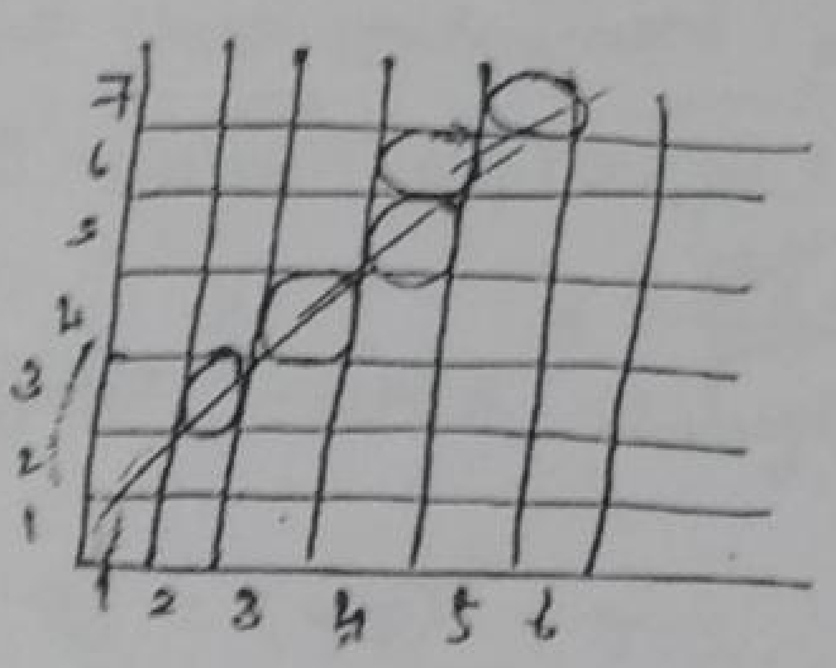
1.25

$$x_{k+1} = x_k + 1/m$$

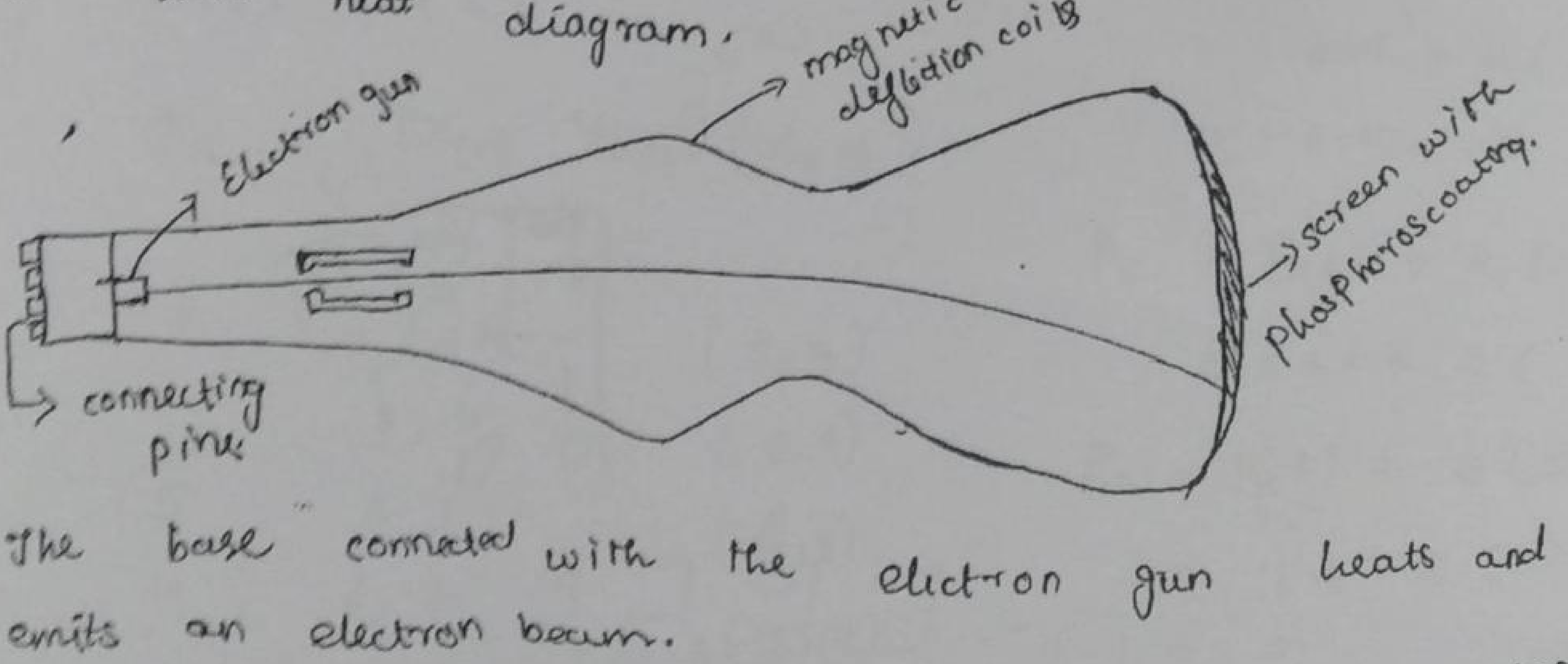
$$y_{k+1} = y_k + 1 \Rightarrow 1/m = 1/1.25 = 0.8$$

$$(x_{k+1}, y_{k+1}) = (\text{round}(x_k + 1/m), y_k)$$

x_k	y_k	$x_{k+1} = x_k + 1/m$	round(x_{k+1})	y_{k+1}	
1	2	1.8	2	3	(2,3)
1.8	3	2.8	3	4	(3,4)
2.8	4	3.6	4	5	(4,5)
3.6	5	4.4	4	6	(4,6)
4.4	6	5.2	5	7	(5,7)



(ii) CRT with neat diagram.



* The base connected with the electron gun heats and emits an electron beam.
* Which is passed through the focusing anode & accelerating anode
* The magnetic deflection coil will make the beam to fall on the

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correct position of the phosphorous coated screen.

12) a)

Midpoint circle algorithm:

1. Input radius r and the circle center (x_c, y_c) and obtain the first point on the circumference of a circle centered on origin as $(x_0, y_0) = (0, r)$

2. Calculate the initial value of the decision parameter as

$$P_0 = 5/4 - r$$

3. At each position. If $P_k < 0$ then next point is (x_{k+1}, y_k) and

$$P_{k+1} = P_k + 2x_{k+1} + 1$$

Otherwise the next point along the circle is (x_k+1, y_k-1)

$$P_{k+1} = P_k + 2x_{k+1} + 1 - 2y_{k+1}$$

where $2x_{k+1} = 2x_k + 2$ and $2y_{k+1} = 2y_k - 2$

4. ~~Sy~~ Determine the symmetry points in the other seven octants

5. move each calculated pixel position (x, y) onto the circular path centered on (x_c, y_c)

$$x = x + x_c \qquad y = y + y_c$$

6. Repeat steps 3 through 5 until $x \geq y$

$(x_c, y_c) = (4, 5)$ $r = 4$.

$P_0 = 1 - r \Rightarrow 1 - 4 = -3$

K	P_K	$(x_{k+1}\ y_{k+1})$	(x, y)
		$(0, 4)$	
0	-3	1, 4	(5, 9)
1	0	~~1~~, 4	(5, 9)
2	5	2 3	(~~6~~, 8)
3	4	3, 2	(~~7~~, 7)

(cont) $\Rightarrow$

$P_1 = P_k + 1 + 2(x_k + 1)$

$= -3 + 1 + 2(1)$

$= -2 + 2 = 0$

$P_2 = P_k + 1 + 2(x_k + 1)$

$= 0 + 1 + 2($

$P_2 = P_k + 1 + 2(x_k + 1)$

$= 1 + 2(2)$

$= 5$

$P_3 = P_k + 1 + 2(x_k + 1) - 2(y_{k+1})$

$= 6 + 2(2) - 2(3)$

$= 6 + 4 - \cancel{6}$

12) b) Mid point ellipse Algorithm.

1. Input r_x, r_y and ellipse center (x_c, y_c) and obtain the first pole ellipse centered on the origin as

$$(x_0, y_0) = (0, r_y)$$

2. Decision parameter.

$$P1_0 = r_y^2 - r_x^2 r_y + \frac{1}{4} r_x^2$$

3. When $P1_K < 0$ then the pt. is (x_{k+1}, y_k)

$$P1_{K+1} = P1_K + 2r_y^2 x_{K+1} + r_y^2$$

when $P1_K > 0$ then the pt is $(x_k + 1\ y_{k-1})$

$$P1_{K+1} = P1_K + 2r_y^2 x_{K+1} - 2r_x^2 y_{K+1} + r_y^2$$

with $2r_y^2 x_{K+1} = 2r_y^2 x_K + 2r_y^2$, $\quad 2r_x^2 y_{K+1} = 2r_x^2 y_k - 2r_x^2$

continue until $2r_y^2 x \geq 2r_x^2 y$

4. Decision parameter of region 2.

$$P2_0 = r_y^2 (x_0 + \tfrac{1}{2})^2 + r_x^2 (y_0 - 1)^2 - r_x^2 r_y^2$$

When $P2_K > 0$ $\quad (x_K, y_{K-1})$

$$P2_{K+1} = P2_K - 2r_x^2 y_{K+1} + r_x^2$$

when $P2_K < 0$ $\quad (x_{K+1}, y_{K-1})$

$$P2_{K+1} = P2_K + 2r_y^2 x_{K+1} - 2r_x^2 y_{K+1} + r_x^2$$

5. Determine the symmetry points in other 3 quadrants.

6. For a given center

$$x = x + x_c \qquad y = y + y_c$$

7. Repeat the steps until $2r_y^2 x \geq 2r_x^2 y$.

$r_y = 8$ $r_x = 10$ center pt (0,0)

Initial pt $(0, r_y) = (0, 8)$

K	$P1_k$	(x_{k+1}, y_{k+1})	$2r_y^2 x_{k+1}$	$(2r_x^2 y_{k+1})$
-	-	0, 8	-	-
0	-711	(1,8)	128	1600
1	-519	(2,8)	256	1600
2	-199	(3,8)	384	1600
3	249	(4,7)	512	1400
4	-575	(5,7)	640	1400
5.	130	(6 6)	786	1200
6.	-238	(7 6)	896	1200
7.	722	(8 5)	1024	1000

Region 2.

1.	-176	(9,4)
2.	276	(9,3)
3.	-224	(10,2)
4.	756	(10,1)
5.	656	(10,0)

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12) a) 2D- Transformation

1. Translation (2)

$P(x,y)$ Given pt.

$T(t_x, t_y)$ translation parameter.

$p' = p + T$

$x' = x + t_x$ $\Rightarrow$ $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \end{bmatrix}$

$y' = y + t_y$

$$\begin{bmatrix} x' \\ y' \\ h \end{bmatrix} = \begin{bmatrix} 1 & 0 & t_x \\ 0 & 1 & t_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

2. Scaline - Re-size (4)

$S(S_x, S_y)$

if $(S_x \neq S_y)$ No change in shape.

if (S_x, S_y) in b/w 0,1 then the pt. is closer to origin. - Size decreases.

if (S_x, S_y) is > 1 then the pt is away from origin size increases.

if $(S_x = S_y)$ then the scaling is done uniformly

$P(x,y)$ $S(S_x, S_y)$

$p' = S \cdot P$ $x' = x \cdot S_x$ $\Rightarrow$ $[x' \; y'] = [x \cdot y] \begin{bmatrix} S_x & 0 \\ 0 & S_y \end{bmatrix}$

$y' = y \cdot S_y$

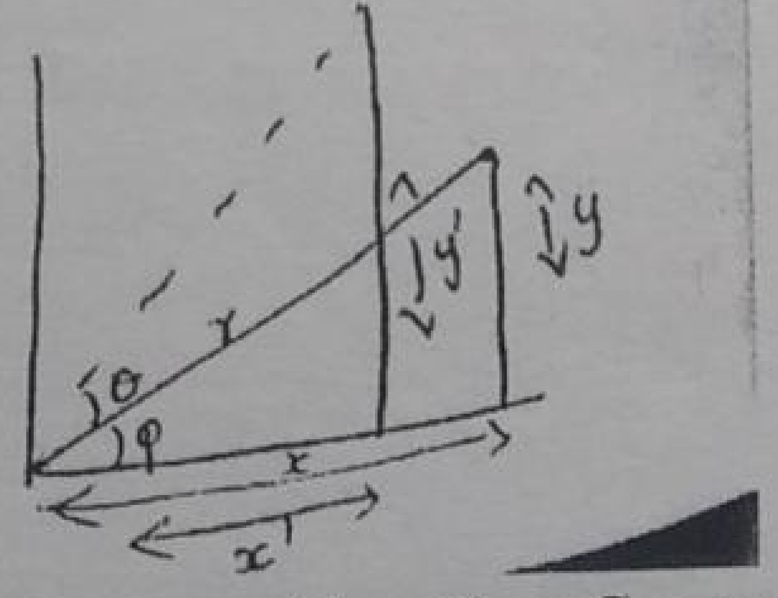
$$\Rightarrow \begin{bmatrix} x' \\ y' \\ h \end{bmatrix} = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

(A)

3. Rotation

$x = r\cos\phi$

$y = r\sin\phi$



New angle after rotation = $(\phi + \theta)$

$x' = r(\cos\phi + \theta)$ $y' = r(\sin\phi + \theta)$

$x' = r\cos\phi\cos\theta - r\sin\phi\sin\theta$

$x' = x\cos\theta - y\sin\theta$

$y' = r\sin\phi\cos\theta + r\cos\phi\sin\theta$

$y' = x\sin\theta + y\cos\theta$

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$

$$\begin{bmatrix} x' \\ y' \\ h \end{bmatrix} = \begin{bmatrix} x & y & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Clockwise rotation

$x' = r\cos(\phi - \theta)$

$y' = r\sin(\phi - \theta)$

$x' = x\cos\theta + y\sin\theta$

$y' = y\cos\theta - x\sin\theta$

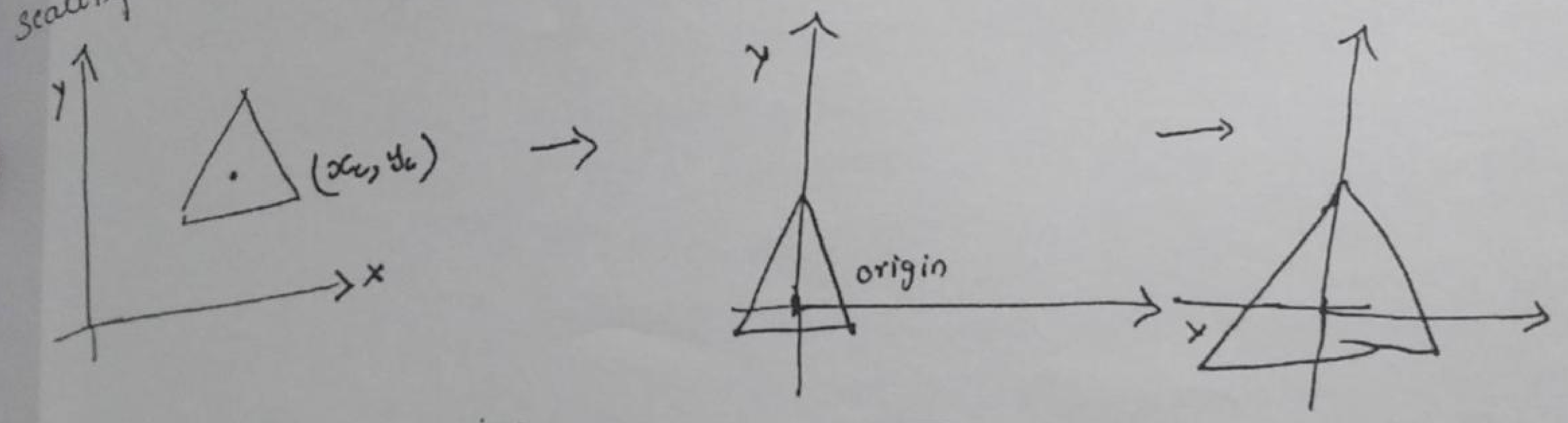
$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

$$\begin{bmatrix} x' \\ y' \\ h \end{bmatrix} = \begin{bmatrix} x & y & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

b) scaling with respect to origin

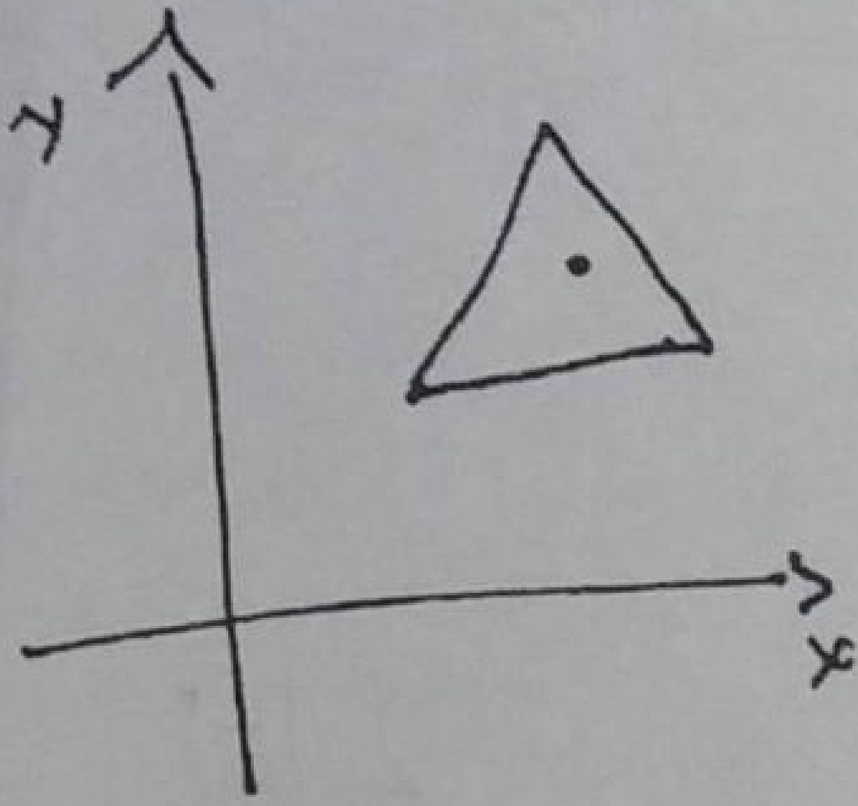
Translation to origin

Scaling

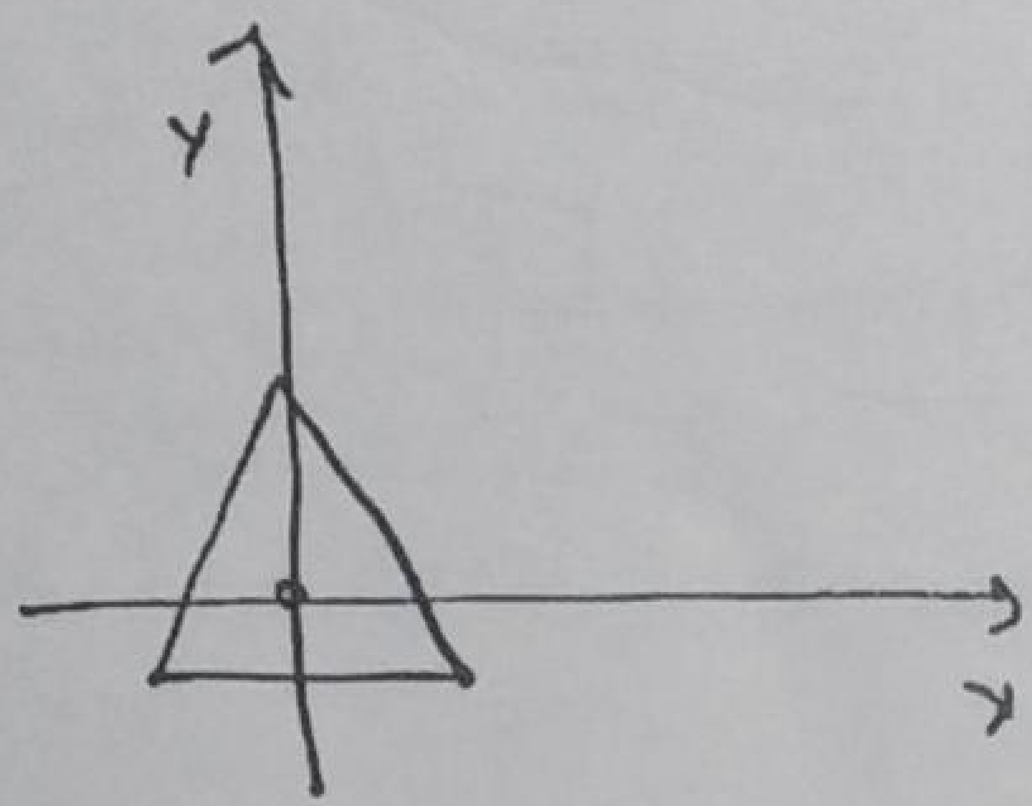


$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -x_c & -y_c & 1 \end{bmatrix} \begin{bmatrix} Sx_1 & 0 & 0 \\ 0 & Sx_2 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} Sx_1 & 0 & 0 \\ 0 & Sx_2 & 0 \\ -x_c Sx_1 & -y_c Sx_2 & 1 \end{bmatrix}$$

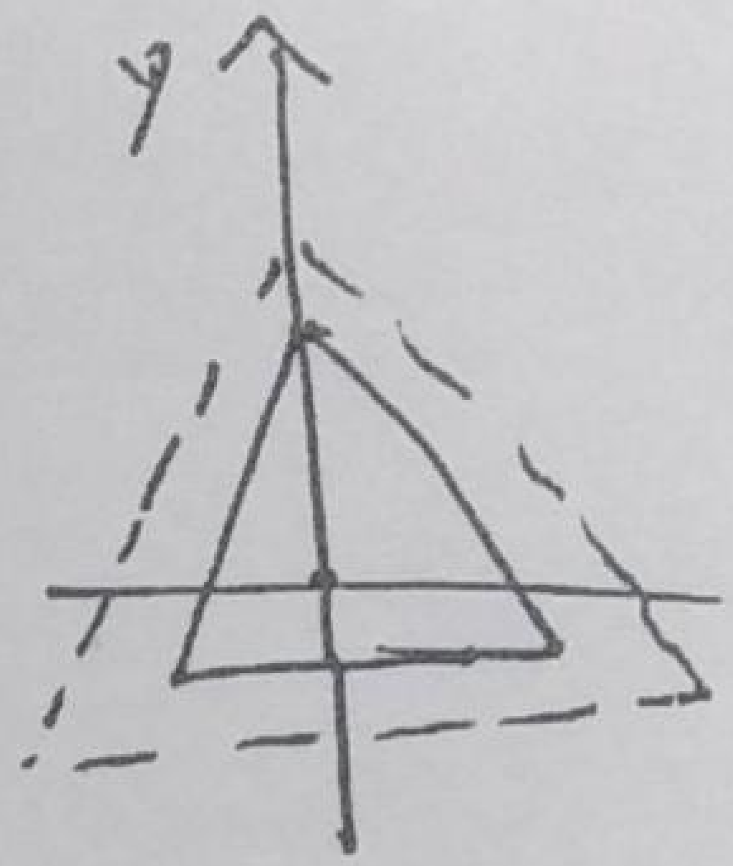
Scaling w.r. to pivot point.



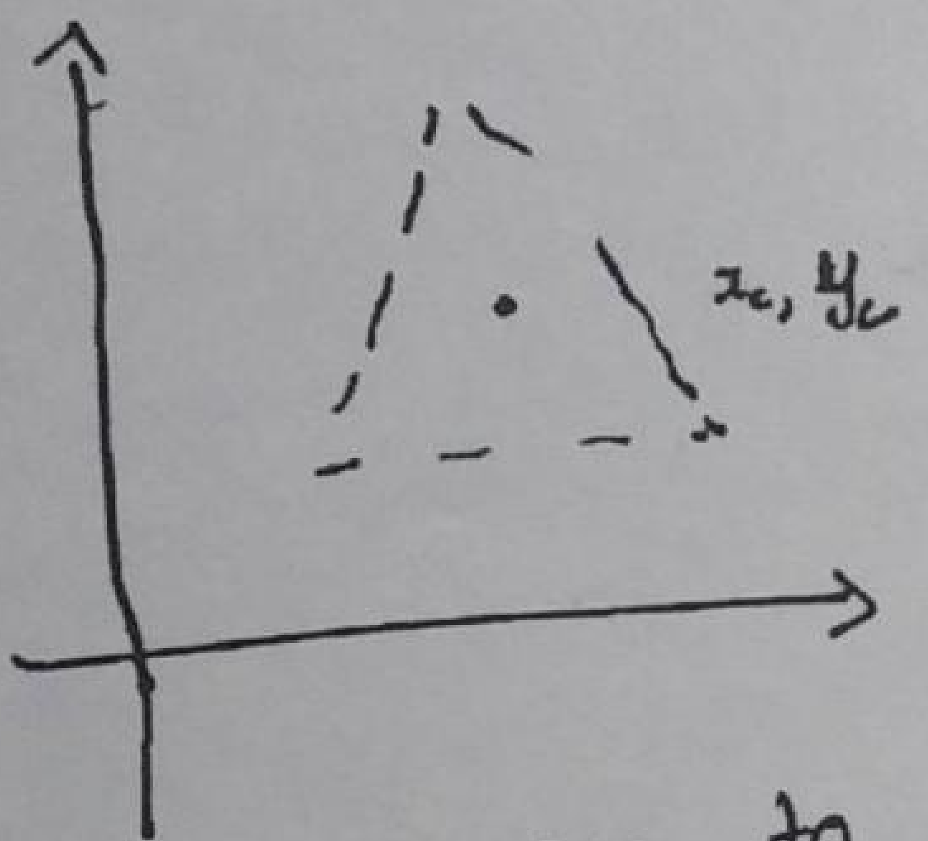
Given



Translation to origin



Scalling



Translation to pivot point.