Q1:A)

General Bresenham's algorithm for all quadrants

```
X=X1
Y=Y1
dX=Abs (X2-X1)
dY=Abs(Y2-Y1)
S1=Sign (X2-X1)
S2=Sign (Y2-Y1)
If dY > dX Then
Begin
    T=dX : dX=dY : dY=T : Interchange=1
End
Else
    Interchange =0
End If
E= 2 dy - dx
For I=1 to dX
Plot (X,Y)
While ( E ≥ 0)
Begin
    If Interchange=1 Then X=X + S1
                     Else Y= Y + S2
    End If
    E= E - 2 dx
End While
If Interchange=1 Then Y=Y + S2
                 Else X=X + S1
End If
```

E = E+ 2 dy

Next I

Finish

Sol 4 : X=0 ; Y=0 ; dX=8 ; dY=4 ; S1=-1 ; S2=-1

Because dX>dY then Interchange=0 ; E=0

I	Plot	E	X	Y
		0	0	0
1	(0,0)			
		-16	0	-1
		-8	-1	-1
2	(-1,-1)			
		0	-2	-1
3	(-2,-1)			
		-16	-2	-2
		-8	-3	-2
4	(-3,-2)			
		0	-4	-2
5	(-4,-2)			
		-16	-4	-3
		-8	-5	-3
6	(-5,-3)			
		0	-6	-3
7	(-6,-3)			
		-16	-6	-4
		8	-7	-4

8	(-7,-4)			
		0	-8	-4

Q1:B)

Draw in any quadric and any direction

Q2:A)

The Calligraphic Refresh graphics display

A Calligraphic (line drawing or vector) refresh CRT display uses a very short persistence phosphor. These displays are frequently called random scan display. Because of the short persistence of the phosphor, the picture painted on the CRT must be repainted or refreshed many times each second. The minimum refresh rate is at least 30 times each second. Refresh rates much lower than 30 times each second result in a flickering image.

The basic calligraphic refresh display requires two elements in addition to the CRT. These are the display buffer and the display controller. The display buffer is contiguous memory containing all the information required to draw the picture on the CRT. The display controller's function is to repeatedly cycle through this information at the refresh rate. Two factors which limit the complexity (number of vectors displayed) of the picture are the size of the display buffer and the speed of the display controller. A further limitation is the speed at which picture information can be processed.

Q2:B)

Features of calligraphic refresh displays

1- It is a vector graphics display
2- Resolution is the same as storage tube display
3- Employee the concept of picture segmentation that support the interactive graphics programs

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Q3:1)
1:tr:the result is (0,0),(2,0),(1,2)

2:Rotation by 180

$$\begin{matrix} 0 & 0 & 1 \\ 2 & 0 & 1 \\ 1 & 2 & 1 \end{matrix} \quad * \quad \begin{matrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{matrix} \quad = \quad \begin{matrix} 0 & 0 & 1 \\ -2 & 0 & 1 \\ -1 & -2 & 1 \end{matrix}$$

3:btr:the result is (2,1),(0,1),(1,-1)

Q3:2)

$$\begin{matrix} 2 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & -1 & 1 \end{matrix} * \begin{matrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{matrix} = \begin{matrix} 2 & -1 & 1 \\ 0 & -1 & 1 \\ 1 & 1 & 1 \end{matrix}$$

Q3:3)

$$\begin{matrix} 2 & -1 & 1 \\ 0 & -1 & 1 \\ 1 & 1 & 1 \end{matrix} * \begin{matrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{matrix} = \begin{matrix} 4 & -2 & 1 \\ 0 & -2 & 1 \\ 2 & 2 & 1 \end{matrix}$$

Q4:1)

$$\begin{matrix} 2 & 2 & 2 & 1 \\ 4 & 2 & 2 & 1 \\ 3 & 2 & 4 & 1 \\ 3 & 4 & 3 & 1 \end{matrix} * \begin{matrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{matrix} = \begin{matrix} -2 & -2 & 2 & 1 \\ -4 & -2 & 2 & 1 \\ -3 & -2 & 4 & 1 \\ -3 & -4 & 3 & 1 \end{matrix}$$

Q4:2)

$$\begin{matrix} -2 & -2 & 2 & 1 \\ -4 & -2 & 2 & 1 \\ -3 & -2 & 4 & 1 \\ -3 & -4 & 3 & 1 \end{matrix} * \begin{matrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{matrix} = \begin{matrix} -2 & -2 & -2 & 1 \\ -4 & -2 & -2 & 1 \\ -3 & -2 & -4 & 1 \\ -3 & -4 & -3 & 1 \end{matrix}$$

Q5)

<u>The Cohen Algorithm</u>

1-Determine the endpoint (X1 , Y1) code1

```
If  X1<Xmin Then

        If Y1>Ymax Then code1=1001

        If  (Y1<Ymax) And (Y1>Ymin) Then code1=0001

        If Y1<Ymin Then code1=0101

End IF

If X1>Xmax Then

        If Y1>Ymax Then code1=1010

        If  (Y1<Ymax) And (Y1>Ymin) Then code1=0010

        If Y1<Ymin Then code1=0110

End IF
```

If (X1 ≤ Xmax) And (X1 ≥ Xmin) Then

If Y1>Ymax Then code1=1000

If (Y1≤Ymax) And (Y1≥Ymin) Then code1=0000

If Y1<Ymin Then code1=0100

End IF

2- Determine the endpoint (X2,Y2) code2 [as code1]

3-Determine the visibility of the line

If code1= code2 = 0000 then the line is visible; draw the line

If code1 And code2 <> 0000 then the line is not visible

If code1 And code2 = 0000 then the line is candidate for clipping

The line KL is visible and the line AB is not visible .