DR B.R. AMBEDKAR NATIONAL INSTITUTE OF TECHNOLOGY JALANDHAR, PUNJAB, INDIA

Computer Graphics
And
Animation Laboratory
CSX-328

Session: Jan-May 2020

SUBMITTED TO-

Mr. Rahul Aggarwal
Assistant Professor
CSE Department

SUBMITTED BY-

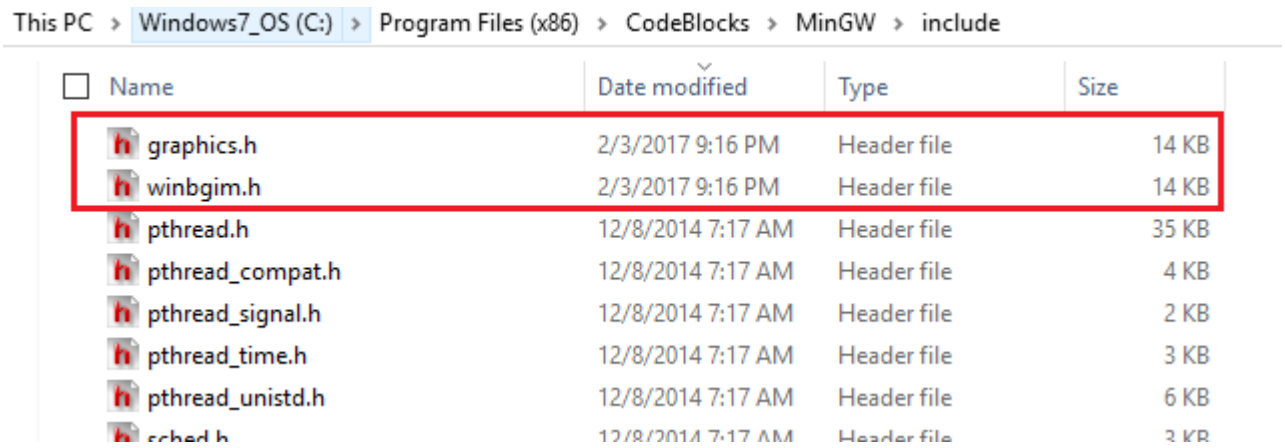
Name – Ankit Goyal
Roll no - 17103011
Group - G-1
Branch – CSE

INDEX

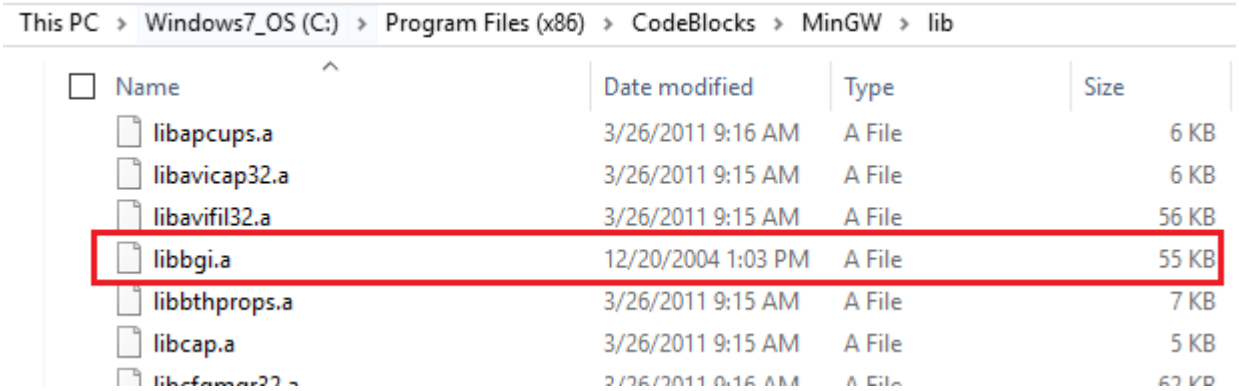
Practical No. 1

Aim: To setup graphics.h library with Code::blocks..

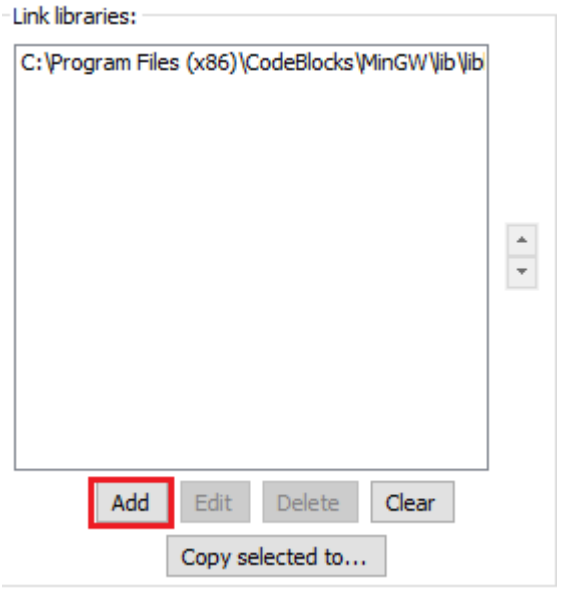
1.) Firstly download the graphics.h and winbgim.h library from http://winbgim.codecutter.org/ and copy them in the folder C:\Program Files (x86)\CodeBlocks\MinGW\include .



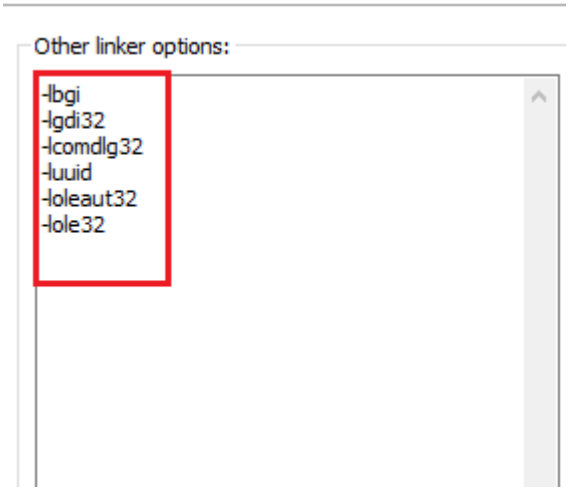
2.) Now download the libbgi.a file from http://winbgim.codecutter.org/ and copy them in the folder C:\Program Files (x86)\CodeBlocks\MinGW\lib.



3.) In Code::Blocks open Settings >> Compiler >>Linker settings click Add button in Link Libraries part and browse and select libbgi.a file from the path C:\Program Files (x86)\CodeBlocks\MinGW\lib.



4.) In Code::Blocks open Settings >> Compiler >>Linker settings in right part (i.e. other linker options) paste commands -lbgi -lgdi32 -lcomdlg32 -luuid -loleaut32 -lole32



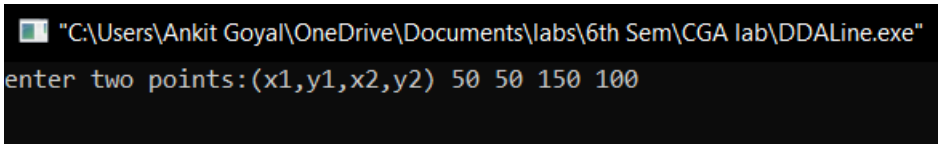
Practical No. 2

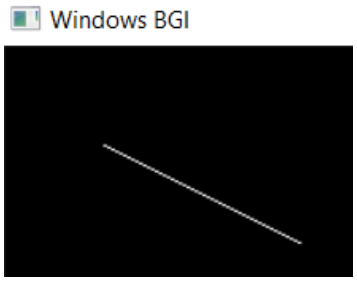
Aim: Write a program for DDA Line Drawing Algorithm.

Program:

```
#include<graphics.h>
#include<bits/stdc++.h>
using namespace std;
int main()
{
   int gd = DETECT ,gm, i=1;
   float x, y,dx,dy,steps;
   int x0, x1, y0, y1;
   initgraph(&gd, &gm, "");
   cout<<"enter two points:(x1,y1,x2,y2) ";
   cin>>x0>>y0>>x1>>y1;
   dx = (float)(x1 - x0);
   dy = (float)(y1 - y0);
   if(dx>=dy)
      steps = dx;
   else
      steps = dy;
   dx = dx/steps;
   dy = dy/steps;
   x = x0;
   y = y0;
   while(i<= steps)
   {
      putpixel(x, y, 15);
      x += dx;
      y += dy;
      i=i+1;
   }
   getch();
   closegraph();
   return 0;
}
```

Output:




Windows BGI

Practical No. 3

Aim: Write a program for Bresenham Line Drawing Algorithm.

Program:

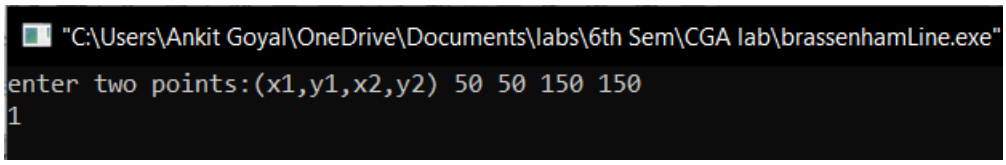
```
#include<bits/stdc++.h>
#include<graphics.h>
using namespace std;
void drawline(int x1, int y1, int x2, int y2)
{
   int dx,dy;
   int x,y,x_end,y_end;
   dx = (x2-x1);
   dy = (y2-y1);
    float m = dy/dx;
    dx = abs(dx);
    dy = abs(dy);
   if(abs(m)<=1 && m>0)
   {
      cout<<1;
      int p = 2*dy-dx;
      if(x1>x2)
      {
         x = x2;
         x_end = x1;
         y = y2;
      }
      else
      {
         x = x1;
         x_end = x2;
         y = y1;
      }
      while(x<=x_end)
      {
         putpixel(x,y,WHITE);
         x = x+1;
         if(p<0)
            p = p + 2*dy;
         else
         {
            y = y+1;
            p = p + 2*(dy-dx);
         }
      }
   }
```

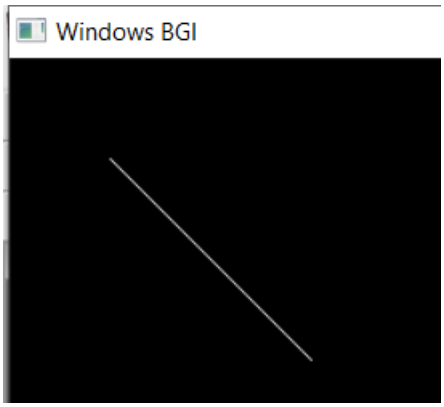
```
else if(abs(m)<=1 && m<0)
{
   cout<<2;
   int p = 2*dy-dx;
   if(x1>x2)
   {
      x = x2;
      x_end = x1;
      y = y2;
   }
   else
   {
      x = x1;
      x_end = x2;
      y = y1;
   }
   while(x<=x_end)
   {
      putpixel(x,y,WHITE);
      x = x+1;
      if(p<0)
         p = p + 2*dy;
      else
      {
         y = y-1;
         p = p + 2*(dy-dx);
      }
   }
}
else if(abs(m)>=1 && m>0)
{
   cout<<3;
   int p = 2*dx-dy;
   if(y1>y2)
   {
      y = y2;
      y_end = y1;
      x= x2;
   }
   else
   {
      x = x1;
      y_end = y2;
      y = y1;
   }
   while(y<=y_end)
```

```
        {
            putpixel(x,y,WHITE);
            y = y+1;
            if(p<0)
                p = p + 2*dx;
            else
            {
                x= x+1;
                p = p + 2*(dx-dy);
            }
        }
    }
    else
    {
        cout<<4;
        int p = 2*dx-dy;
        if(y1>y2)
        {
            y = y2;
            y_end = y1;
            x= x2;
        }
        else
        {
            x = x1;
            y_end = y2;
            y = y1;
        }
        while(y<=y_end)
        {
            putpixel(x,y,WHITE);
            y = y+1;
            if(p<0)
                p = p + 2*dx;
            else
            {
                x= x-1;
                p = p + 2*(dx-dy);
            }
        }
    }
}
int main()
{
    int gdriver=DETECT, gmode, error, x0, y0, x1, y1;
    cout<<"enter two points:(x1,y1,x2,y2) ";
```

```
    cin>>x0>>y0;
    cin>>x1>>y1;
    initgraph(&gdriver, &gmode, "");
    drawline(x0, y0, x1, y1);
    getch();
    return 0;
}
```

Output:





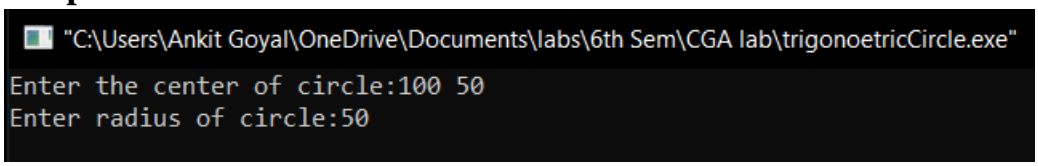
Practical No. 4

Aim: Write a program for Trigonometric Circle Drawing Algorithm.

Program:

```
#include<iostream>
#include<conio.h>
#include<graphics.h>
#include<math.h>
#define color 15
using namespace std;
void eightSymmetricPointsPlot(int xc,int yc,int x,int y)
{
   putpixel(x+xc,y+yc,color);
   putpixel(x+xc,-y+yc,color);
   putpixel(-x+xc,-y+yc,color);
   putpixel(-x+xc,y+yc,color);
   putpixel(y+xc,x+yc,color);
   putpixel(y+xc,-x+yc,color);
   putpixel(-y+xc,-x+yc,color);
   putpixel(-y+xc,x+yc,color);
}
int main(){

   float xc,yc,p,x1,y1,y,r,x;
   float theta;
   int gd=DETECT,gm;
   initgraph(&gd,&gm,"");
   cout<<"Enter the center of circle:";
   cin>>xc>>yc;
   cout<<"Enter radius of circle:";
   cin>>r;
   float i=0;
   while(i<=45){
      theta=(i*3.14)/180;
      x=(r*cos(theta));
      y=(r*sin(theta));
      eightSymmetricPointsPlot(xc,yc,x,y);
      i=i+0.01;
   }
   getch();
   closegraph();
   return 0;
}
```

Output:


"C:\Users\Ankit Goyal\OneDrive\Documents\labs\6th Sem\CGA lab\trigonoetricCircle.exe"
Enter the center of circle:100 50
Enter radius of circle:50


Windows BGI

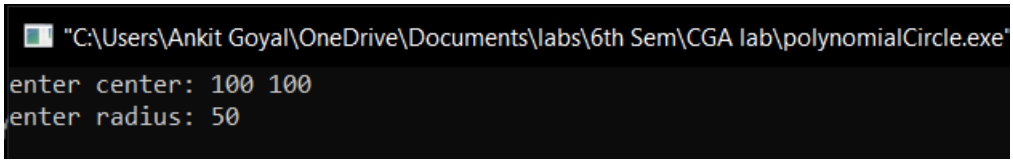
Practical No. 5

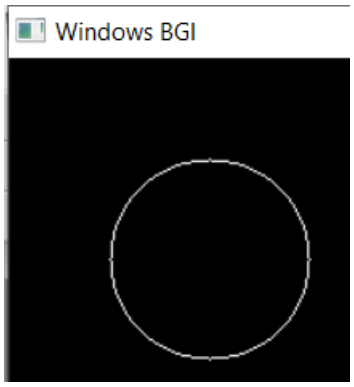
Aim: Write a program for Polynomial Circle Drawing Algorithm.

Program:

```
#include<graphics.h>
#include<conio.h>
#include<math.h>
#include<bits/stdc++.h>
using namespace std;
void setPixel(int x, int y, int h, int k)
{
   putpixel(x+h, y+k, 15);
   putpixel(x+h, -y+k, 15);
   putpixel(-x+h, -y+k, 15);
   putpixel(-x+h, y+k, 15);
   putpixel(y+h, x+k, 15);
   putpixel(y+h, -x+k, 15);
   putpixel(-y+h, -x+k, 15);
   putpixel(-y+h, x+k, 15);
}
main()
{
   int gd=0, gm,h,k,r;
   double x,y,x2;
   cout<<"enter center: ";
   cin>>h>>k;
   cout<<"enter radius: ";
   cin>>r;
   initgraph(&gd, &gm, "");
   setbkcolor(WHITE);
   x=0,y=r;
   x2 = r/sqrt(2);
   while(x<=x2)
   {
      y = sqrt(r*r - x*x);
      setPixel(floor(x), floor(y), h,k);
      x += 1;
   }
   getch();
   closegraph();
   return 0;
}
```

Output:


"C:\Users\Ankit Goyal\OneDrive\Documents\labs\6th Sem\CGA lab\polynomialCircle.exe"
enter center: 100 100
enter radius: 50


Windows BGI

Practical No. 6

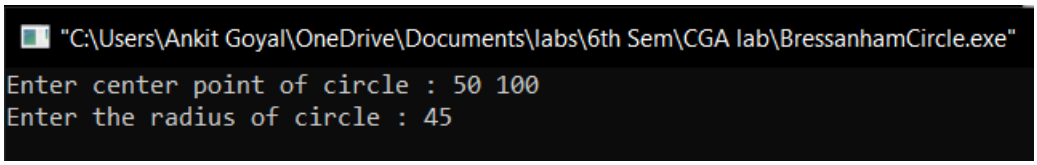
Aim: Write a program for Bresenham Circle Drawing Algorithm.

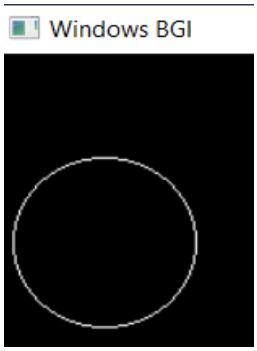
Program:

```
#include <graphics.h>
#include <bits/stdc++.h>
#define color 15
using namespace std;
void eightWaySymmetricPlot(int xc,int yc,int x,int y)
{
   putpixel(x+xc,y+yc,color);
   putpixel(x+xc,-y+yc,color);
   putpixel(-x+xc,-y+yc,color);
   putpixel(-x+xc,y+yc,color);
   putpixel(y+xc,x+yc,color);
   putpixel(y+xc,-x+yc,color);
   putpixel(-y+xc,-x+yc,color);
   putpixel(-y+xc,x+yc,color);
}
void BressanhamCircle(int xc,int yc,int r)
{
   int x,y,d;
   x=0;
   y=r;
   d=3-2*r;
   eightWaySymmetricPlot(xc,yc,x,y);
   while(x<=y)
   {
      if(d<=0)
         d=d+4*x+6;
      else
      {
         d=d+4*x-4*y+10;
         y=y-1;
      }
      x=x+1;
      eightWaySymmetricPlot(xc,yc,x,y);
   }
}
int main()
{
   int gdriver = DETECT, gmode;
   int xc,yc,r;
   initgraph(&gdriver, &gmode, "");
   cout<<"Enter center point of circle : ";
```

```
    cin>>xc>>yc;
    cout<<"Enter the radius of circle : ";
    cin>>r;
    BressanhamCircle(xc,yc,r);
    getch();
    closegraph();
    return 0;
}
```

Output:





Practical No. 7

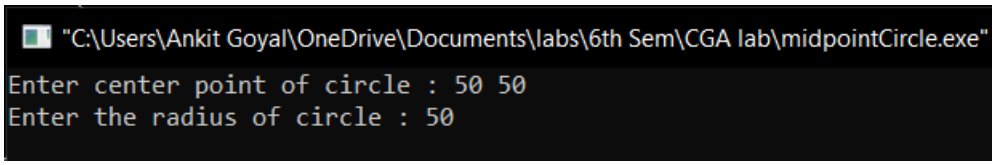
Aim: Write a program for Mid-Point Circle Drawing Algorithm.

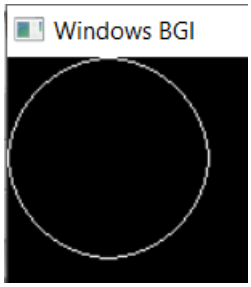
Program:

```
#include<iostream>
#include<bits/stdc++.h>
#include<graphics.h>
#define color 15
using namespace std;
void eightSymmetricPointsPlot(int xc,int yc,int x,int y)
{
   putpixel(x+xc,y+yc,color);
   putpixel(x+xc,-y+yc,color);
   putpixel(-x+xc,-y+yc,color);
   putpixel(-x+xc,y+yc,color);
   putpixel(y+xc,x+yc,color);
   putpixel(y+xc,-x+yc,color);
   putpixel(-y+xc,-x+yc,color);
   putpixel(-y+xc,x+yc,color);
}
void midPointCircle(int xc,int yc,int r)
{
   int x,y,d;
   x=0;
   y=r;
   d=1-r;
   eightSymmetricPointsPlot(xc,yc,x,y);
   while(x<=y)
   {
      if(d<=0)
      {
         d=d+2*x+10;
      }
      else
      {
         d=d+2*x-2*y+5;
         y=y-1;
      }
      x=x+1;
      eightSymmetricPointsPlot(xc,yc,x,y);
   }
}
int main()
{
         int gdriver = DETECT, gmode;
```

```
    int xc,yc,r;
    initgraph(&gdriver, &gmode, "");

    cout<<"Enter center point of circle : ";
    cin>>xc>>yc;
    cout<<"Enter the radius of circle : ";
    cin>>r;
        midPointCircle(xc, yc, r);
        getch();
        return 0;
}
```

Output:





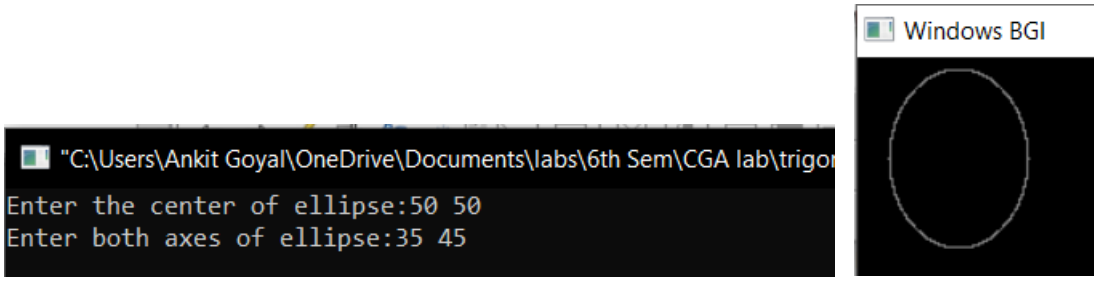
Practical No. 8

Aim: Write a program for Trigonometric Ellipse Drawing Algorithm.

Program:

```
#include<iostream>
#include<conio.h>
#include<graphics.h>
#include<math.h>
using namespace std;
void plot4pixels(int x,int y,int h,int k)
{
   putpixel(x+h,y+k,8);
   putpixel(x+h,-y+k,8);
   putpixel(-x+h,y+k,8);
   putpixel(-x+h,-y+k,8);
}
int main(){
   float xc,yc,y,a,b,x;
   float theta;
   int gd=DETECT,gm;
   initgraph(&gd,&gm,"");
   cout<<"Enter the center of ellipse:";
   cin>>xc>>yc;
   cout<<"Enter both axes of ellipse:";
   cin>>a>>b;
   float i=0;
   while(i<=90){
      theta=(i*3.14)/180;
      x=(a*cos(theta));
      y=(b*sin(theta));
      plot4pixels(x,y,xc,yc);
      i=i+0.01;
   }
   getch();
   closegraph();
   return 0;
}
```

Output:



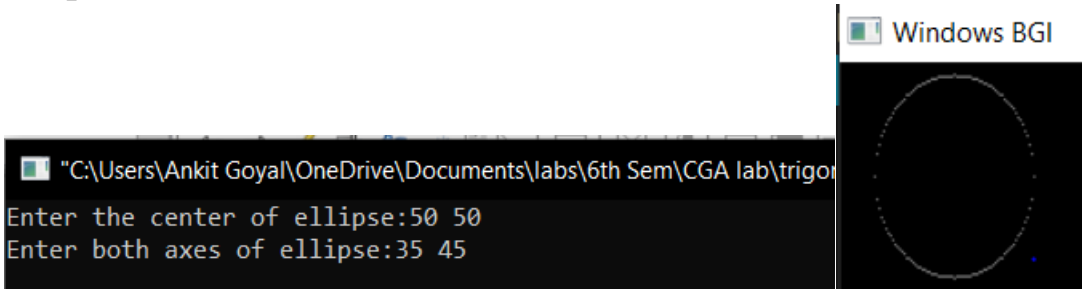
Practical No. 9

Aim: Write a program for Polynomial Ellipse Drawing Algorithm.

Program:

```
#include<iostream>
#include<graphics.h>
#include<conio.h>
#include<math.h>
using namespace std;
void plot4pixels(int x,int y,int h,int k)
{
   putpixel(x+h,y+k,8);
   putpixel(x+h,-y+k,8);
   putpixel(-x+h,y+k,8);
   putpixel(-x+h,-y+k,8);
}
int main()
{
   int x,y,r,i,h,k,a,b;
   cout<<"Enter the center of ellipse:";
   cin>>h>>k;
   cout<<"Enter both axes of ellipse:";
   cin>>a>>b;
   x=0;
   y=b;
   int gd=DETECT,gm;
   initgraph(&gd,&gm,"");
   setbkcolor(WHITE);
   while(x<a)
   {
      plot4pixels(x,y,h,k);
      x++;
      y=b*sqrt(((a*a)-(x*x*1.0))/(a*a));
   }
   plot4pixels(x,y,h,k);
   getch();
}
```

Output:



Practical No. 10

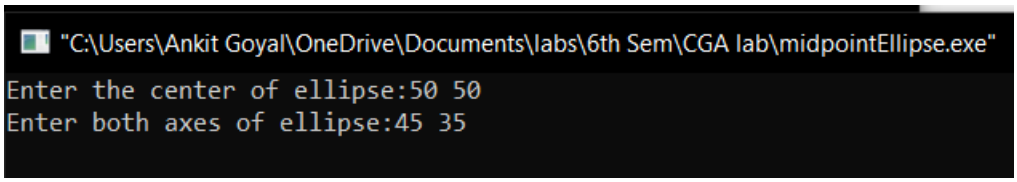
Aim: Write a program for Mid-Point Ellipse Drawing Algorithm.

Program:

```
#include<iostream>
#include<conio.h>
#include<graphics.h>
#include<math.h>
using namespace std;
void plot4pixels(int x,int y,int h,int k)
{
   putpixel(x+h,y+k,8);
   putpixel(x+h,-y+k,8);
   putpixel(-x+h,y+k,8);
   putpixel(-x+h,-y+k,8);
}
void midptellipse(int a, int b, int xc, int yc)
{
        float dx, dy, d1, d2, x, y;
        x = 0;
        y = b;
        d1 = (b * b) - (a * a * b) + (0.25 * a * a);
        dx = 2 * b * b * x;
        dy = 2 * a * a * y;
        while (dx < dy)
        {
                plot4pixels(x,y,xc,yc);
                if (d1 < 0)
                {
                        x++;
                        dx = dx + (2 * b * b);
                        d1 = d1 + dx + (b * b);
                }
                else
                {
                        x++;
                        y--;
                        dx = dx + (2 * b * b);
                        dy = dy - (2 * a * a);
                        d1 = d1 + dx - dy + (b * b);
                }
        }
        d2 = ((b * b) * ((x + 0.5) * (x + 0.5))) +
                ((a * a) * ((y - 1) * (y - 1))) -
                (a * a * b * b);
```

```
        while (y >= 0)
        {
                plot4pixels(x,y,xc,yc);
                if (d2 > 0)
                {
                        y--;
                        dy = dy - (2 * a * a);
                        d2 = d2 + (a * a) - dy;
                }
                else
                {
                        y--;
                        x++;
                        dx = dx + (2 * b * b);
                        dy = dy - (2 * a * a);
                        d2 = d2 + dx - dy + (a * a);
                }
        }
}
int main(){
   float xc,yc,y,a,b,x;
   float theta;
   int gd=DETECT,gm;
   initgraph(&gd,&gm,"");
   cout<<"Enter the center of ellipse:";
   cin>>xc>>yc;
   cout<<"Enter both axes of ellipse:";
   cin>>a>>b;
   midptellipse(a,b,xc,yc);
   getch();
   closegraph();
   return 0;
}
```

Output:



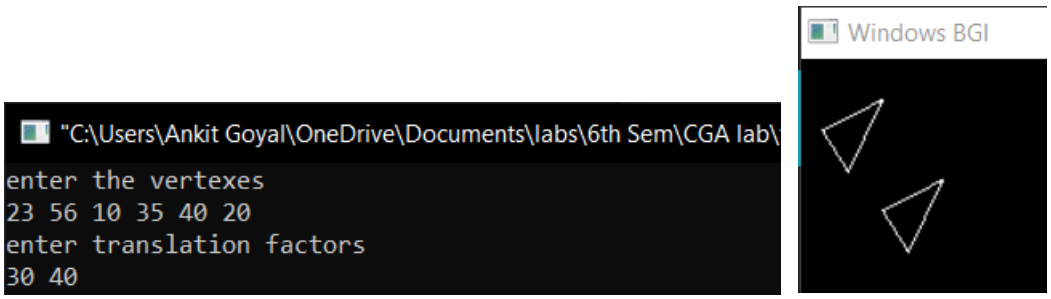
Practical No. 11

Aim: To translate an object with translation parameters in X and Y directions.

Program:

```
#include<iostream>
#include<graphics.h>
using namespace std;
void scale(float x[], float y[], float sx, float sy)
{
   line(x[0], y[0], x[1], y[1]);
   line(x[1], y[1], x[2], y[2]);
   line(x[2], y[2], x[0], y[0]);
   for(int i=0;i<3;i++)
   {
      x[i]+=sx;
      y[i]+=sy;
   }
   line(x[0], y[0], x[1], y[1]);
   line(x[1], y[1], x[2], y[2]);
   line(x[2], y[2], x[0], y[0]);
}
int main()
{
  int gd = DETECT, gm;
  initgraph(&gd, &gm, "");
  float x[3],y[3],sx,sy;
  cout<<"enter the vertexes\n";
  cin>>x[0]>>y[0]>>x[1]>>y[1]>>x[2]>>y[2];
  cout<<"enter translation factors\n";
  cin>>sx>>sy;
  scale(x, y, sx,sy);
  getch();
  closegraph();
}
```

Output:



Practical No. 12

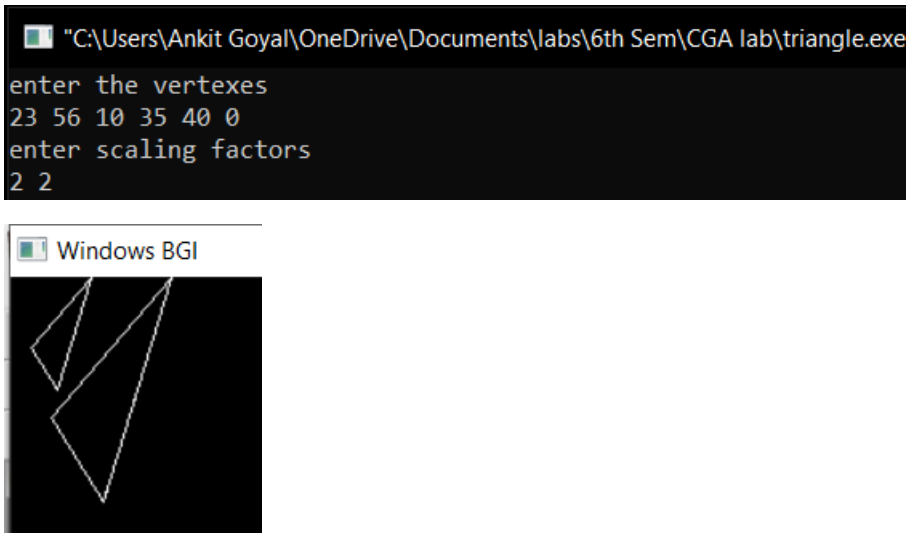
Aim: To translate an object with scaling factors along X and Y directions.

Program:

```
#include<iostream>
#include<graphics.h>
using namespace std;
void findNewCoordinate(float s[][2], float p[][1])
{
   float temp[2][1] = { 0 };
   for (int i = 0; i < 2; i++)
      for (int j = 0; j < 1; j++)
         for (int k = 0; k < 2; k++)
            temp[i][j] += (s[i][k] * p[k][j]);
   p[0][0] = temp[0][0];
   p[1][0] = temp[1][0];
}
void scale(float x[], float y[], float sx, float sy)
{
   line(x[0], y[0], x[1], y[1]);
   line(x[1], y[1], x[2], y[2]);
   line(x[2], y[2], x[0], y[0]);
   float s[2][2] = { sx, 0, 0, sy };
   float p[2][1];
   for (int i = 0; i < 3; i++)
   {
      p[0][0] = x[i];
      p[1][0] = y[i];
      findNewCoordinate(s, p);
      x[i] = p[0][0];
      y[i] = p[1][0];
   }
   line(x[0], y[0], x[1], y[1]);
   line(x[1], y[1], x[2], y[2]);
   line(x[2], y[2], x[0], y[0]);
}
int main()
{
  int gd = DETECT, gm;
  initgraph(&gd, &gm, "");
  float x[3],y[3],sx,sy;
  cout<<"enter the vertexes\n";
  cin>>x[0]>>y[0]>>x[1]>>y[1]>>x[2]>>y[2];
  cout<<"enter scaling factors\n";
  cin>>sx>>sy;
```

```
  scale(x, y, sx,sy);
  getch();
  closegraph();
}
```

Output:



Practical No. 13

Aim: To Draw an ellipse and rotate it through an angle theta.

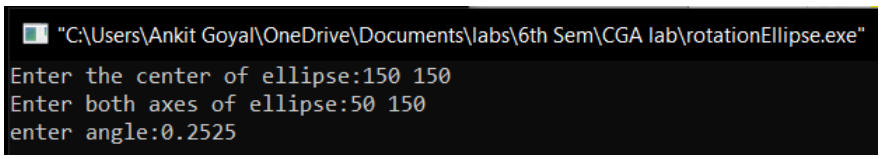
Program:

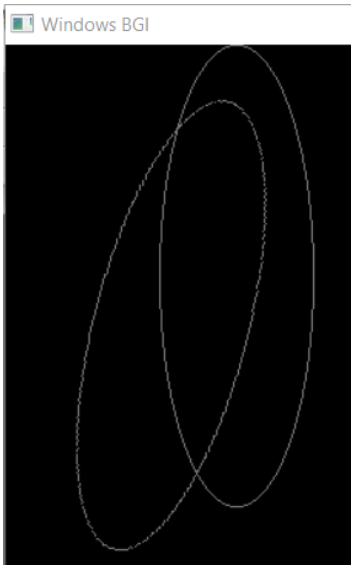
```
#include<iostream>
#include<conio.h>
#include<graphics.h>
#include<math.h>
#include<bits/stdc++.h>
using namespace std;

vector<double> v[3];
void plot4pixels(int x,int y,int h,int k)
{
   putpixel(x+h,y+k,8);
   v[0].push_back(x+h);
   v[1].push_back(y+k);
   v[2].push_back(1);

   putpixel(x+h,-y+k,8);
   v[0].push_back(x+h);
   v[1].push_back(-y+k);
   v[2].push_back(1);

   putpixel(-x+h,y+k,8);
   v[0].push_back(-x+h);
   v[1].push_back(y+k);
   v[2].push_back(1);

   putpixel(-x+h,-y+k,8);
   v[0].push_back(-x+h);
   v[1].push_back(-y+k);
   v[2].push_back(1);
}
void midptellipse(int a, int b, int xc, int yc)
{
        float dx, dy, d1, d2, x, y;
        x = 0;
        y = b;
        d1 = (b * b) - (a * a * b) + (0.25 * a * a);
        dx = 2 * b * b * x;
        dy = 2 * a * a * y;
        while (dx < dy)
        {
```

```
                plot4pixels(x,y,xc,yc);
                if (d1 < 0)
                {
                        x++;
                        dx = dx + (2 * b * b);
                        d1 = d1 + dx + (b * b);
                }
                else
                {
                        x++;
                        y--;
                        dx = dx + (2 * b * b);
                        dy = dy - (2 * a * a);
                        d1 = d1 + dx - dy + (b * b);
                }
        }
        d2 = ((b * b) * ((x + 0.5) * (x + 0.5))) +
                ((a * a) * ((y - 1) * (y - 1))) -
                (a * a * b * b);
        while (y >= 0)
        {
                plot4pixels(x,y,xc,yc);
                if (d2 > 0)
                {
                        y--;
                        dy = dy - (2 * a * a);
                        d2 = d2 + (a * a) - dy;
                }
                else
                {
                        y--;
                        x++;
                        dx = dx + (2 * b * b);
                        dy = dy - (2 * a * a);
                        d2 = d2 + dx - dy + (a * a);
                }
        }
}
int main(){

   float xc,yc,y,a,b,x,temp;
   double theta;
   int gd=DETECT,gm;
   initgraph(&gd,&gm,"");
   cout<<"Enter the center of ellipse:";
   cin>>xc>>yc;
```

```
    cout<<"Enter both axes of ellipse:";
    cin>>a>>b;
    cout<<"enter angle:";
    cin>>theta;
    double R_mat[3][3]={{cos(theta),-sin(theta),0},{sin(theta),cos(theta),0},{0,0,1}};
    midptellipse(a,b,xc,yc);
    vector<double> res[3];
    for(int i=0;i<3;i++)
    {
       for(int j=0;j<v[0].size();j++)
       {
          temp=0;
          for(int k=0;k<3;k++)
                temp+=R_mat[i][k]*v[k][j];
          res[i].push_back(temp);
       }
    }
    for(int i=0;i<res[0].size();i++)
          putpixel(res[0][i],res[1][i],8);
    getch();
    closegraph();
    return 0;
}
```

Output:





Practical No. 14

Aim: To Draw an Rectangle and translate, rotate and scale it.

Program:

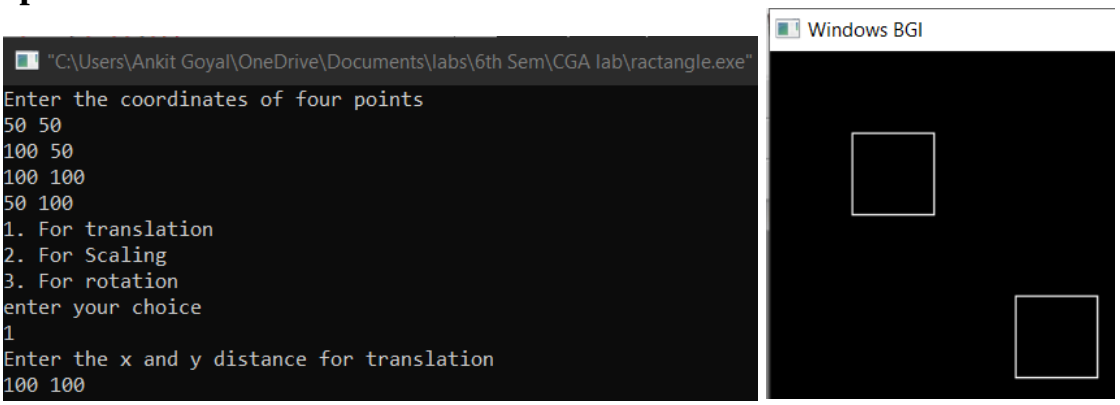
```
#include<bits/stdc++.h>
#include<graphics.h>
using namespace std;
void findNewCoordinate(int s[][2], int p[][1])
{
	int temp[2][1] = { 0 };
	for (int i = 0; i < 2; i++)
		for (int j = 0; j < 1; j++)
			for (int k = 0; k < 2; k++)
				temp[i][j] += (s[i][k] * p[k][j]);
	p[0][0] = temp[0][0];
	p[1][0] = temp[1][0];
}
void findNewCoordinate(float s[][2], int p[][1])
{
	float temp[2][1] = { 0 };
	for (int i = 0; i < 2; i++)
		for (int j = 0; j < 1; j++)
			for (int k = 0; k < 2; k++)
				temp[i][j] += (s[i][k] * p[k][j]);
	p[0][0] = temp[0][0];
	p[1][0] = temp[1][0];
}
void findNewCoordinates(int s[][3], int p[][1])
{
	int temp[3][1] = { 0 };
	for (int i = 0; i < 3; i++)
		for (int j = 0; j < 1; j++)
			for (int k = 0; k < 3; k++)
				temp[i][j] += (s[i][k] * p[k][j]);
	p[0][0] = temp[0][0];
	p[1][0] = temp[1][0];
}
void scale(int x[], int y[], int sx, int sy)
{
	line(x[0], y[0], x[1], y[1]);
	line(x[1], y[1], x[2], y[2]);
	line(x[2], y[2], x[3], y[3]);
	line(x[3] , y[3] ,x[0] , y[0] );
	int s[2][2] = { sx, 0, 0, sy };
	int p[2][1];
```

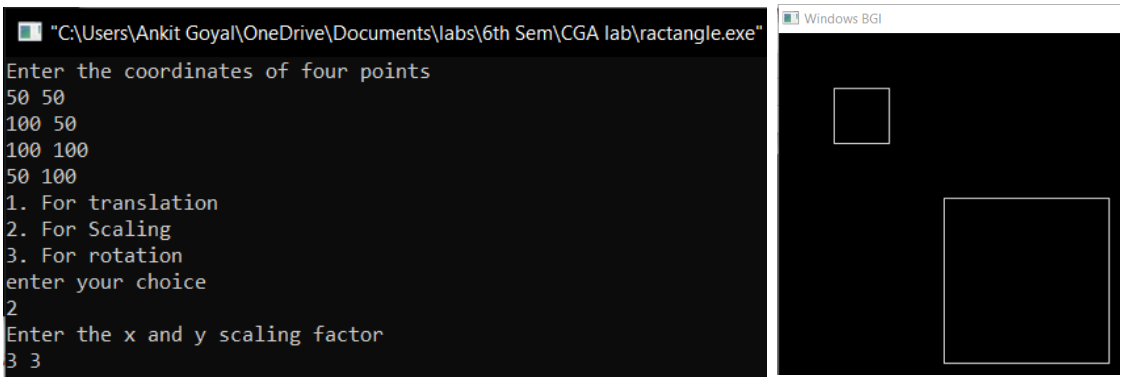
```
	for (int i = 0; i <= 3; i++)
	{
		p[0][0] = x[i];
		p[1][0] = y[i];
		findNewCoordinate(s, p);
		x[i] = p[0][0];
		y[i] = p[1][0];
	}
	line(x[0], y[0], x[1], y[1]);
	line(x[1], y[1], x[2], y[2]);
	line(x[2], y[2], x[3], y[3]);
	line(x[3] , y[3] , x[0] , y[0] );
}
void translate(int x[], int y[], int tx, int ty)
{
	int s[3][3] = { 1, 0, tx, 0 , 1 , ty , 0 , 0 , 1 };
	int p[3][1];
	int n=3;
	for (int i = 0; i <= 3; i++)
	{
		p[0][0] = x[i];
		p[1][0] = y[i];
		p[2][0] = 1;
		findNewCoordinates(s, p);
		x[i] = p[0][0];
		y[i] = p[1][0];
	}
	line(x[0], y[0], x[1], y[1]);
	line(x[1], y[1], x[2], y[2]);
	line(x[2], y[2], x[3], y[3]);
	line(x[3] , y[3] , x[0] , y[0] );
}
void rotation(int x[] , int y[] , float theta)
{

   float c = cos(theta);
   float se = sin(theta);
   float s[2][2] = { c, -se, se, c };
   int p[2][1];
   for (int i = 0; i <= 3; i++)
	{
		p[0][0] = x[i];
		p[1][0] = y[i];
		findNewCoordinate(s, p);
		x[i] = p[0][0];
		y[i] = p[1][0];
```

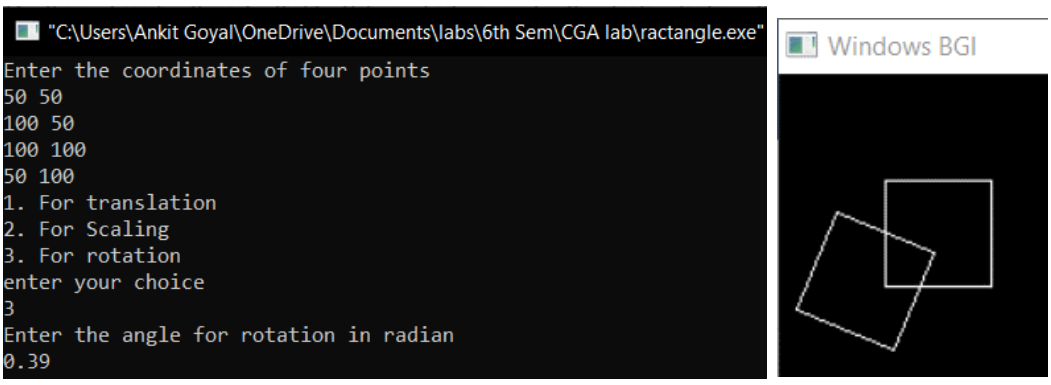
```
        }
        line(x[0], y[0], x[1], y[1]);
        line(x[1], y[1], x[2], y[2]);
        line(x[2], y[2], x[3], y[3]);
        line(x[3] , y[3] , x[0] , y[0] );
}
int main()
{
        int y[4] ,x[4] ;
        cout<<"Enter the coordinates of four points\n";
        for(int i=0; i<4;i++)
        cin>>x[i]>>y[i];
        int gd, gm ,sx , sy;
        detectgraph(&gd, &gm);
        initgraph(&gd, &gm," ");
        line(x[0], y[0], x[1], y[1]);
        line(x[1], y[1], x[2], y[2]);
        line(x[2], y[2], x[3], y[3]);
        line(x[3] , y[3] ,x[0] , y[0] );
        float theta;
        int tx , ty;
        cout<<"1. For translation\n2. For Scaling\n3. For rotation\n enter your choice\n ";
        int ch;
        cin>>ch;
        switch(ch)
        {
   case 1:
      {
        cout<<"Enter the x and y distance for translation\n";
        cin>>tx>>ty;
        translate(x , y , tx, ty);
        break;
      }
   case 2:
      {
        cout<<"Enter the x and y scaling factor\n";
        cin>>sx>>sy;
        scale(x , y, sx , sy);
        break;
      }
   case 3:
      {
        cout<<"Enter the angle for rotation in radian\n";
        cin>>theta;
        rotation(x , y , theta);
        break;
```

```
        }
    default :
        cout<<"enter a valid choice\n";
            }
            getch();
            return 0;
}
```

Output:







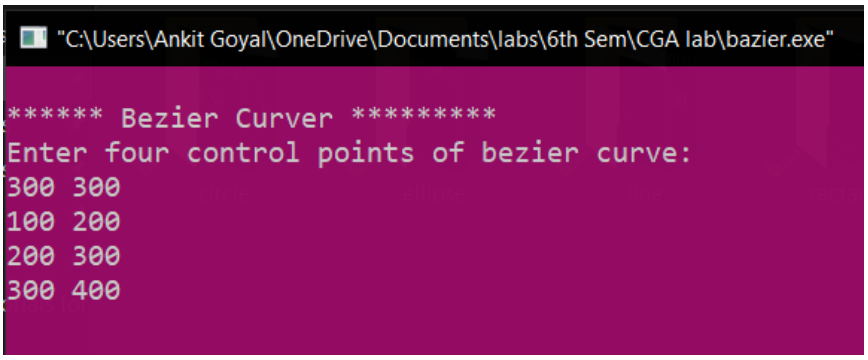
Practical No. 15

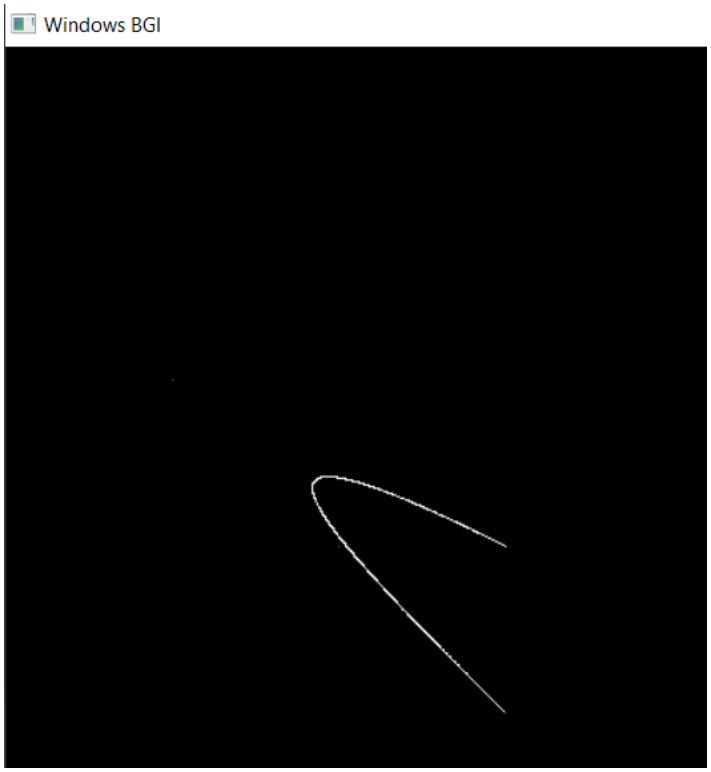
Aim: Write a program to implement Bezier Curve.

Program:

```
include<iostream.h>
#include<conio.h>
#include<math.h>
#include<graphics.h>
void main()
{
int gd=DETECT,gm;
initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
int x[4],y[4],i;
double put_x, put_y, t;
cout<<"\n****** Bezier Curver *********"<<endl;
cout<<"Enter four control points of bezier curve: "<<endl;
for(i=0;i<4;i++){
   cin>>x[i]>>y[i];
   putpixel(x[i], y[i],3);
}
for(t=0.0;t<=1.0;t+=0.001){
   put_x=pow(1-t, 3)*x[0]+3*t*pow(1-t,2)*x[1]+3*t*t*(1-t)*x[2]+pow(t,3)*x[3];
   put_y=pow(1-t, 3)*y[0]+3*t*pow(1-t,2)*y[1]+3*t*t*(1-t)*y[2]+pow(t,3)*y[3];
   putpixel(put_x,put_y,WHITE);
}
getch();
closegraph();
}
```

Output:




Windows BGI

Practical No. 16

Aim: Write a program to implement Liang Basky Line Clipping Algorithm.

Program:

```
#include<iostream.h>
#include<graphics.h>
#include<math.h>
#include<dos.h>
void main()
{
	int i,gd=DETECT,gm;
	int x1,y1,x2,y2,xmin,xmax,ymin,ymax,xx1,xx2,yy1,yy2,dx,dy;
	float t1,t2,p[4],q[4],temp;

	x1=120;
	y1=120;
	x2=300;
	y2=300;

	xmin=100;
	ymin=100;
	xmax=250;
	ymax=250;

	initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
	rectangle(xmin,ymin,xmax,ymax);
	dx=x2-x1;
	dy=y2-y1;

	p[0]=-dx;
	p[1]=dx;
	p[2]=-dy;
	p[3]=dy;

	q[0]=x1-xmin;
	q[1]=xmax-x1;
	q[2]=y1-ymin;
	q[3]=ymax-y1;

	for(i=0;i<4;i++)
	{
		if(p[i]==0)
		{
			cout<<"line is parallel to one of the clipping boundary";
			if(q[i]>=0)
```

```
                {
                        if(i<2)
                        {
                                if(y1<ymin)
                                {
                                        y1=ymin;
                                }

                                if(y2>ymax)
                                {
                                        y2=ymax;
                                }

                                line(x1,y1,x2,y2);
                        }

                        if(i>1)
                        {
                                if(x1<xmin)
                                {
                                        x1=xmin;
                                }

                                if(x2>xmax)
                                {
                                        x2=xmax;
                                }

                                line(x1,y1,x2,y2);
                        }
                }
        }
}

t1=0;
t2=1;

for(i=0;i<4;i++)
{
        temp=q[i]/p[i];

        if(p[i]<0)
        {
                if(t1<=temp)
                        t1=temp;
        }
```

```
                else
                {
                        if(t2>temp)
                                t2=temp;
                }
        }

        if(t1<t2)
        {
                xx1 = x1 + t1 * p[1];
                xx2 = x1 + t2 * p[1];
                yy1 = y1 + t1 * p[3];
                yy2 = y1 + t2 * p[3];
                line(xx1,yy1,xx2,yy2);
        }
        delay(5000);
        closegraph();
}
```

Output: