Lab 1: Introduction to graphics primitive and graphics drivers

a) Software requirement: Turbo C / C++

BASIC GRAPHICS FUNCTION

1) INITGRAPH

- Initializes the graphics system.

Declaration

- Void far initgraph(int far *graphdriver)

Remarks

- To start the graphic system, you must first call initgraph.
- Initgraph initializes the graphic system by loading a graphics driver from disk (or validating a registered driver) then putting the system into graphics mode.
- Initgraph also resets all graphics settings (color, palette, current position, viewport, etc) to their defaults then resets graph.

2) GETPIXEL, PUTPIXEL

- Getpixel gets the color of a specified pixel.
- Putpixel places a pixel at a specified point.

Decleration

- Unsigned far getpixel(int x, int y)
- Void far putpixel(int x, int y, int color)

Remarks

- Getpixel gets the color of the pixel located at (x,y);
- Putpixel plots a point in the color defined at (x, y)

Return value

- Getpixel returns the color of the given pixel.
- Putpixel does not return

3) CLOSE GRAPH

- Shuts down the graphic system.

Declaration

- Void far closegraph(void);

Remarks

- Close graph deallocates all memory allocated by the graphic system.
- It then restores the screen to the mode it was in before you called initgraph.

Return value

- None.

4) ARC, CIRCLE, PIESLICE

- arc draws a circular arc.
- Circle draws a circle
- Pieslice draws and fills a circular pieslice

Declaration

- Void far arc(int x, int y, int stangle, int endangle, int radius);
- Void far circle(int x, int y, int radius);
- Void far pieslice(int x, int y, int stangle, int endangle, int radius);

Remarks

- Arc draws a circular arc in the current drawing color
- Circle draws a circle in the current drawing color
- Pieslice draws a pieslice in the current drawing color, then fills it using the current fill pattern and fill color.

5) ELLIPSE, FILL ELIPSE, SECTOR

- Ellipse draws an elliptical arc.
- Fill ellipse draws and fills ellipse.
- Sector draws and fills an elliptical pie slice.

Declaration

- Void far ellipse (int x, int y, int stangle, int endangle, int xradius, int yradius)
- Void far fill ellipse (int x, int y, int xradius, int yradius)
- Void farsectoe(int x, int y, int stangle, int endangle, int xradius, int yradius)

Remarks

- Ellipse draws an elliptical arc in the current drawing color.
- Fill ellipse draws an elliptical arc in the current drawing color and then fills it with fill color and fill pattern.
- Sector draws an elliptical pie slice in the current drawing color and then fills it using the pattern and color defined by setfill style or setfill pattern.

6) FLOODFILL

- Flood-fills a bounded region.

Declaration

- Void far floodfill(int x, int y, int border)

Remarks

- Floodfills an enclosed area on bitmap device.
- The area bounded by the color border is flooded with the current fill pattern and fill color.
- (x,y) is a “seed point”

¬ If the seed is within an enclosed area, the inside will be filled.

¬ If the seed is outside the enclosed area, the exterior will be filled.

- Use fillpoly instead of floodfill wherever possible so you can maintain code compatibility with future versions.
- Floodfill doesnot work with the IBM-8514 driver.

Return value

- If an error occurs while flooding a region, graph result returns „1‟.

7) GETCOLOR, SETCOLOR

- Getcolor returns the current drawing color.
- Setcolor returns the current drawing color.

Declaration

- Int far getcolor(void);
- Void far setcolor(int color)

Remarks

- Getcolor returns the current drawing color.
- Setcolor sets the current drawing color to color, which can range from 0 to getmaxcolor.
- To set a drawing color with set color, you can pass either the color number or the equivalent color name.

8) LINE, LINEREL, LINETO

- Line draws a line between two specified pints.
- Onerel draws a line relative distance from current position (CP).
- Linrto draws a line from the current position (CP) to(x,y).
- Void far lineto(int x, int y)

Remarks

- Line draws a line from (x1, y1) to (x2, y2) using the current color, line style and thickness. It does not update the current position (CP).
- Linerel draws a line from the CP to a point that is relative distance (dx, dy) from the CP, then advances the CP by (dx, dy).
- Lineto draws a line from the CP to (x, y), then moves the CP to (x,y).

Return value

- None

9) RECTANGLE

- Draws a rectangle in graphics mode.

Decleration

- Void far rectangle (int left, int top, int right, int bottom)

Remarks

- It draws a rectangle in the current line style, thickness and drawing color.
- (left, top) is the upper left corner of the rectangle, and (right, bottom) is its lower right corner.

Return value

LAB 2: Implementation of line drawing algorithms – DDA(Digital Differential Algorithm)

Algorithm:

```
Step 1. Declare the variables, x1,y1 and x2 , y2 dx, dy ,del x, del y as real and k as integer.

Step 2. Perform

dx = x2-x1

dy = y2 – y1

Step 3. Test if |dy|<|dx| then

        Steps = |dx|

        Else steps = |dy|

Step 4. set del x = dx/steps

        del y = dy/steps

        x= x1

        y = y1

Step 5. Plot (x, y)

Step 6. Do for k = 1 to steps

x = x+ delx

y = y +del y

Plot (x,y)
```

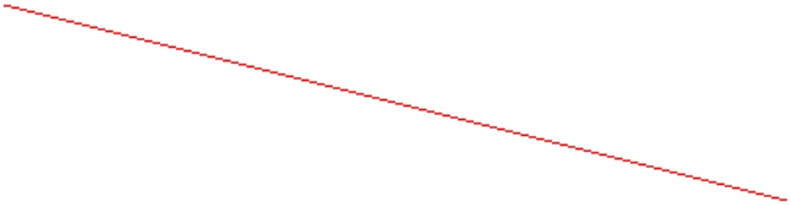
Program using C language:

```
#include<graphics.h>

#include<conio.h>

#include<stdio.h>

void main()
```

```
{
    int gd =  DETECT ,gm, i;
    float x, y,dx,dy,steps;
    int x0, x1, y0, y1;
    initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
    setbkcolor(WHITE);
    x0 = 100 , y0 = 200, x1 = 500, y1 = 300;
    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;
    i = 1;
    while(i<= steps)
    {
        putpixel(x, y, RED);
```

```
            x += dx;

            y += dy;

            i=i+1;

    }

    getch();

    closegraph();

}
```

Output:



LAB 3: Implementation of line drawing algorithms – Bresenham's Line Algorithm

Algorithm:

```
Step1: Start Algorithm

Step2: Declare variable $x_1$, $x_2$, $y_1$, $y_2$, d, $i_1$, $i_2$, dx, dy

Step3: Enter value of $x_1$, $y_1$, $x_2$, $y_2$
        Where x1, y1 are coordinates of starting point
        And $x_2$, $y_2$ are coordinates of Ending point

Step4: Calculate $dx = x_2-x_1$
        Calculate $dy = y_2-y_1$
        Calculate $i_1=2 * dy$
        Calculate $i_2=2 * (dy - dx)$
        Calculate $d=i_1 - dx$

Step5: Consider (x, y) as starting point and $x_{end}$ as maximum possible value of x.
        If $dx < 0$
            Then $x = x_2$
            $y = y_2$
            $x_{end} = x_1$
        If $dx > 0$
          Then $x = x_1$
        $y = y_1$
            $x_{end} = x_2$

Step6: Generate point at (x, y) coordinates.

Step7: Check if whole line is generated.
        If $x > = x_{end}$
        Stop.

Step8: Calculate co-ordinates of the next pixel
        If $d < 0$
          Then $d = d + i_1$
        If $d \geq 0$
     Then $d = d + i_2$
        Increment $y = y + 1$

Step9: Increment $x = x + 1$

Step10: Draw a point of latest (x, y) coordinates
```

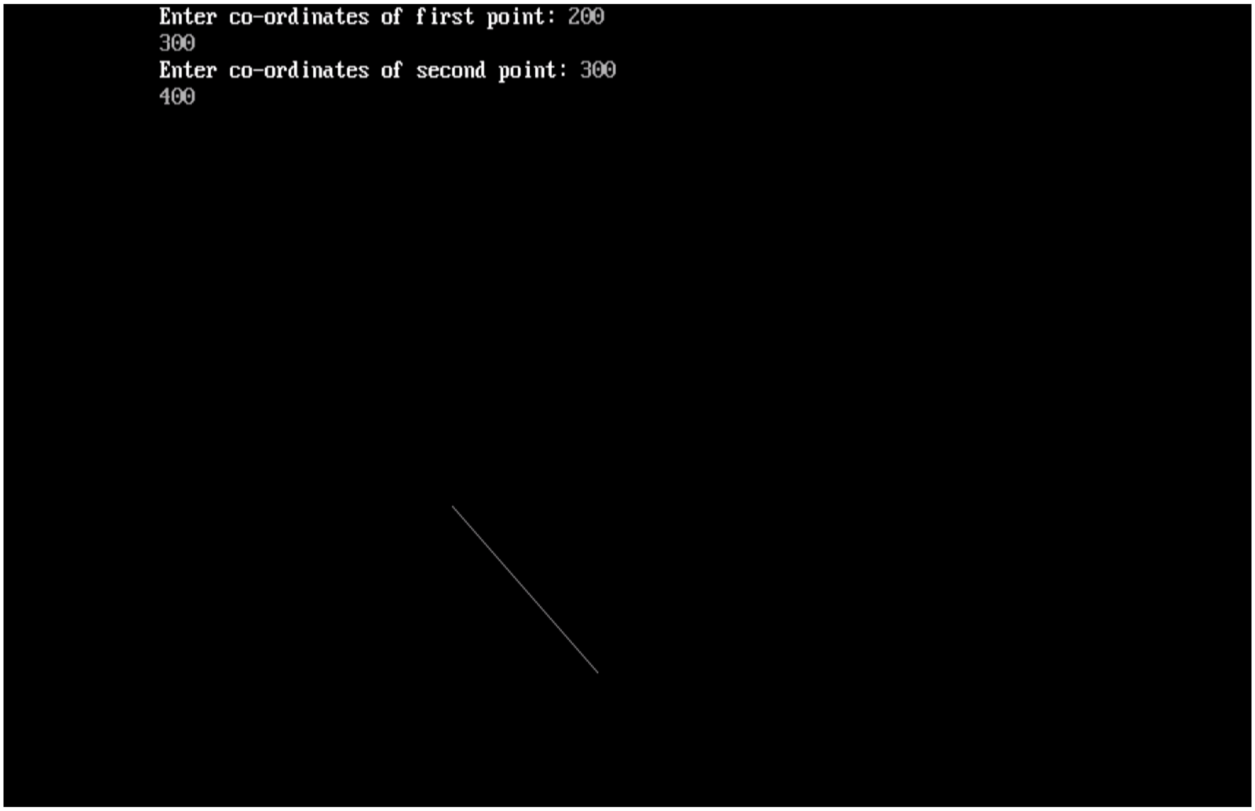
Step11: Go to step 7

Step12: End

Program using C language:

```
#include<stdio.h>
#include<graphics.h>
void drawline(int x0, int y0, int x1, int y1)
{
    int dx, dy, p, x, y;
    dx = x1-x0;
    dy = y1-y0;
    x=x0;
    y=y0;
    p=2*dy-dx;
    while(x<x1)
    {
        if(p>=0) {
            putpixel(x,y,7);
            y=y+1;
            p=p+2*dy-2*dx;
        }
        else {
            putpixel(x,y,7);
            p=p+2*dy;}
            x=x+1;
        }
}

int main()

{

    int gdriver=DETECT, gmode, error, x0, y0, x1, y1;

    initgraph(&gdriver, &gmode, "c:\\turboc3\\bgi");

    printf("Enter co-ordinates of first point: ");

    scanf("%d%d", &x0, &y0);

    printf("Enter co-ordinates of second point: ");

    scanf("%d%d", &x1, &y1);

    drawline(x0, y0, x1, y1);

    return 0;

}
```

Output:



```
Enter co-ordinates of first point: 200
300
Enter co-ordinates of second point: 300
400
```

Lab 1: Introduction to graphics primitive and graphics drivers

b) Software requirement: Turbo C / C++

BASIC GRAPHICS FUNCTION

7) INITGRAPH

- Initializes the graphics system.

Declaration

- Void far initgraph(int far *graphdriver)

Remarks

- To start the graphic system, you must first call initgraph.
- Initgraph initializes the graphic system by loading a graphics driver from disk (or validating a registered driver) then putting the system into graphics mode.
- Initgraph also resets all graphics settings (color, palette, current position, viewport, etc) to their defaults then resets graph.

8) GETPIXEL, PUTPIXEL

- Getpixel gets the color of a specified pixel.
- Putpixel places a pixel at a specified point.

Decleration

- Unsigned far getpixel(int x, int y)
- Void far putpixel(int x, int y, int color)

Remarks

- Getpixel gets the color of the pixel located at (x,y);
- Putpixel plots a point in the color defined at (x, y)

Return value

- Getpixel returns the color of the given pixel.
- Putpixel does not return

9) CLOSE GRAPH

- Shuts down the graphic system.

Declaration

- Void far closegraph(void);

Remarks

- Close graph deallocates all memory allocated by the graphic system.
- It then restores the screen to the mode it was in before you called initgraph.

Return value

- None.

10) ARC, CIRCLE, PIESLICE

- arc draws a circular arc.
- Circle draws a circle
- Pieslice draws and fills a circular pieslice

Declaration

- Void far arc(int x, int y, int stangle, int endangle, int radius);
- Void far circle(int x, int y, int radius);
- Void far pieslice(int x, int y, int stangle, int endangle, int radius);

Remarks

- Arc draws a circular arc in the current drawing color
- Circle draws a circle in the current drawing color
- Pieslice draws a pieslice in the current drawing color, then fills it using the current fill pattern and fill color.

11) ELLIPSE, FILL ELIPSE, SECTOR

- Ellipse draws an elliptical arc.
- Fill ellipse draws and fills ellipse.
- Sector draws and fills an elliptical pie slice.

Declaration

- Void far ellipse (int x, int y, int stangle, int endangle, int xradius, int yradius)
- Void far fill ellipse (int x, int y, int xradius, int yradius)
- Void farsectoe(int x, int y, int stangle, int endangle, int xradius, int yradius)

Remarks

- Ellipse draws an elliptical arc in the current drawing color.
- Fill ellipse draws an elliptical arc in the current drawing color and then fills it with fill color and fill pattern.
- Sector draws an elliptical pie slice in the current drawing color and then fills it using the pattern and color defined by setfill style or setfill pattern.

12) FLOODFILL

- Flood-fills a bounded region.

Declaration

- Void far floodfill(int x, int y, int border)

Remarks

- Floodfills an enclosed area on bitmap device.
- The area bounded by the color border is flooded with the current fill pattern and fill color.
- (x,y) is a “seed point”

¬ If the seed is within an enclosed area, the inside will be filled.

¬ If the seed is outside the enclosed area, the exterior will be filled.

- Use fillpoly instead of floodfill wherever possible so you can maintain code compatibility with future versions.
- Floodfill doesnot work with the IBM-8514 driver.

Return value

- If an error occurs while flooding a region, graph result returns „1‟.

7) GETCOLOR, SETCOLOR

- Getcolor returns the current drawing color.
- Setcolor returns the current drawing color.

Declaration

- Int far getcolor(void);
- Void far setcolor(int color)

Remarks

- Getcolor returns the current drawing color.
- Setcolor sets the current drawing color to color, which can range from 0 to getmaxcolor.
- To set a drawing color with set color, you can pass either the color number or the equivalent color name.

10) LINE, LINEREL, LINETO

- Line draws a line between two specified pints.
- Onerel draws a line relative distance from current position (CP).
- Linrto draws a line from the current position (CP) to(x,y).
- Void far lineto(int x, int y)

Remarks

- Line draws a line from (x1, y1) to (x2, y2) using the current color, line style and thickness. It does not update the current position (CP).
- Linerel draws a line from the CP to a point that is relative distance (dx, dy) from the CP, then advances the CP by (dx, dy).
- Lineto draws a line from the CP to (x, y), then moves the CP to (x,y).

Return value

- None

11) RECTANGLE

- Draws a rectangle in graphics mode.

Decleration

- Void far rectangle (int left, int top, int right, int bottom)

Remarks

- It draws a rectangle in the current line style, thickness and drawing color.
- (left, top) is the upper left corner of the rectangle, and (right, bottom) is its lower right corner.

Return value

LAB 2: Implementation of line drawing algorithms – DDA(Digital Differential Algorithm)

Algorithm:

```
Step 1. Declare the variables, x1, y1 and x2 , y2 dx, dy ,del x, del y as real and k as integer.
Step 2. Perform
dx = x2-x1
dy = y2 – y1
Step 3. Test if |dy|<|dx| then
        Steps = |dx|
        Else steps = |dy|
Step 4. set del x = dx/steps
        del y = dy/steps
        x= x1
        y = y1
Step 5. Plot (x, y)
Step 6. Do for k = 1 to steps
x = x+ delx
y = y +del y
Plot (x,y)
```

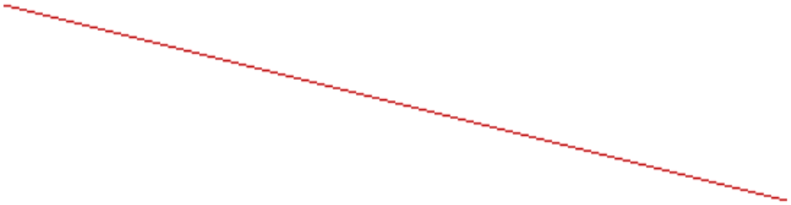
Program using C language:

```
#include<graphics.h>

#include<conio.h>

#include<stdio.h>

void main()
```

```
{
   int gd =  DETECT ,gm, i;
   float x, y,dx,dy,steps;
   int x0, x1, y0, y1;
   initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
   setbkcolor(WHITE);
   x0 = 100 , y0 = 200, x1 = 500, y1 = 300;
   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;
   i = 1;
   while(i<= steps)
   {
       putpixel(x, y, RED);
```

```
            x += dx;

            y += dy;

            i=i+1;

    }

    getch();

    closegraph();

}
```

Output:



LAB 3: Implementation of line drawing algorithms – Bresenham's Line Algorithm

Algorithm:

```
Step1: Start Algorithm

Step2: Declare variable $x_1$, $x_2$, $y_1$, $y_2$, d, $i_1$, $i_2$, dx, dy

Step3: Enter value of $x_1$, $y_1$, $x_2$, $y_2$
        Where x1, y1 are coordinates of starting point
        And $x_2$, $y_2$ are coordinates of Ending point

Step4: Calculate $dx = x_2-x_1$
        Calculate $dy = y_2-y_1$
        Calculate $i_1=2 * dy$
        Calculate $i_2=2 * (dy - dx)$
        Calculate $d=i_1 - dx$

Step5: Consider (x, y) as starting point and $x_{end}$ as maximum possible value of x.
        If dx < 0
            Then $x = x_2$
            $y = y_2$
            $x_{end} = x_1$
        If dx > 0
          Then $x = x_1$
        $y = y_1$
            $x_{end} = x_2$

Step6: Generate point at (x, y) coordinates.

Step7: Check if whole line is generated.
        If $x > = x_{end}$
        Stop.

Step8: Calculate co-ordinates of the next pixel
        If d < 0
          Then $d = d + i_1$
        If $d \geq 0$
     Then $d = d + i_2$
        Increment y = y + 1

Step9: Increment x = x + 1

Step10: Draw a point of latest (x, y) coordinates
```

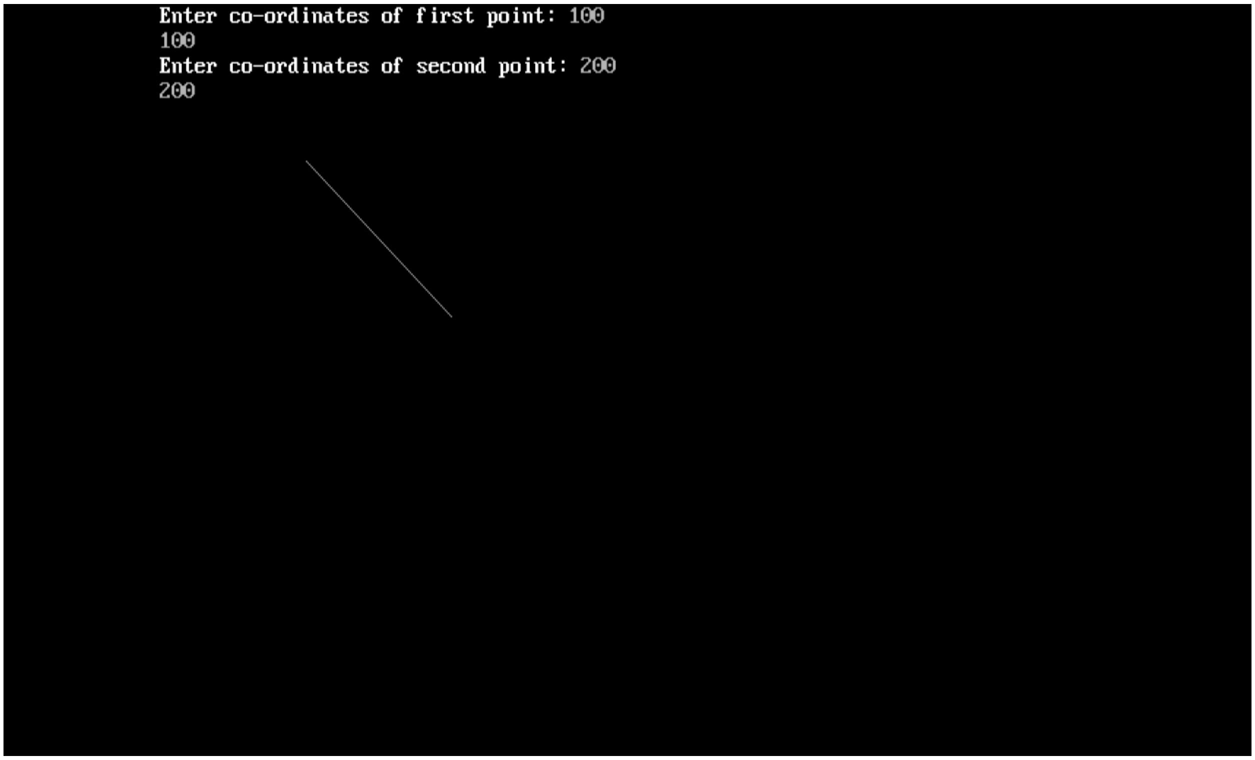
Step11: Go to step 7

Step12: End

Program using C language:

```
#include<stdio.h>
#include<graphics.h>
void drawline(int x0, int y0, int x1, int y1)
{
    int dx, dy, p, x, y;
    dx=x1-x0;
    dy=y1-y0;
    x=x0;
    y=y0;
    p=2*dy-dx;
    while(x<x1)
    {
        if(p>=0) {
            putpixel(x,y,7);
            y=y+1;
            p=p+2*dy-2*dx;
        }
        else {
            putpixel(x,y,7);
            p=p+2*dy;}
            x=x+1;
        }
}
int main()
{
    int gdriver=DETECT, gmode, error, x0, y0, x1, y1;
    initgraph(&gdriver, &gmode, "c:\\turboc3\\bgi");
    printf("Enter co-ordinates of first point: ");
    scanf("%d%d", &x0, &y0);
    printf("Enter co-ordinates of second point: ");
    scanf("%d%d", &x1, &y1);
    drawline(x0, y0, x1, y1);
    return 0;
}
```

Output:



```
Enter co-ordinates of first point: 100
100
Enter co-ordinates of second point: 200
200
```

Lab 1: Introduction to graphics primitive and graphics drivers

c) Software requirement: Turbo C / C++

BASIC GRAPHICS FUNCTION

13) **INITGRAPH**

- Initializes the graphics system.

Declaration

- Void far initgraph(int far *graphdriver)

Remarks

- To start the graphic system, you must first call initgraph.
- Initgraph initializes the graphic system by loading a graphics driver from disk (or validating a registered driver) then putting the system into graphics mode.
- Initgraph also resets all graphics settings (color, palette, current position, viewport, etc) to their defaults then resets graph.

14) **GETPIXEL, PUTPIXEL**

- Getpixel gets the color of a specified pixel.
- Putpixel places a pixel at a specified point.

Decleration

- Unsigned far getpixel(int x, int y)
- Void far putpixel(int x, int y, int color)

Remarks

- Getpixel gets the color of the pixel located at (x,y);
- Putpixel plots a point in the color defined at (x, y)

Return value

- Getpixel returns the color of the given pixel.
- Putpixel does not return

15) **CLOSE GRAPH**

- Shuts down the graphic system.

Declaration

- Void far closegraph(void);

Remarks

- Close graph deallocates all memory allocated by the graphic system.
- It then restores the screen to the mode it was in before you called initgraph.

Return value

- None.

16) ARC, CIRCLE, PIESLICE

- arc draws a circular arc.
- Circle draws a circle
- Pieslice draws and fills a circular pieslice

Declaration

- Void far arc(int x, int y, int stangle, int endangle, int radius);
- Void far circle(int x, int y, int radius);
- Void far pieslice(int x, int y, int stangle, int endangle, int radius);

Remarks

- Arc draws a circular arc in the current drawing color
- Circle draws a circle in the current drawing color
- Pieslice draws a pieslice in the current drawing color, then fills it using the current fill pattern and fill color.

17) ELLIPSE, FILL ELIPSE, SECTOR

- Ellipse draws an elliptical arc.
- Fill ellipse draws and fills ellipse.
- Sector draws and fills an elliptical pie slice.

Declaration

- Void far ellipse (int x, int y, int stangle, int endangle, int xradius, int yradius)
- Void far fill ellipse (int x, int y, int xradius, int yradius)
- Void farsectoe(int x, int y, int stangle, int endangle, int xradius, int yradius)

Remarks

- Ellipse draws an elliptical arc in the current drawing color.
- Fill ellipse draws an elliptical arc in the current drawing color and then fills it with fill color and fill pattern.
- Sector draws an elliptical pie slice in the current drawing color and then fills it using the pattern and color defined by setfill style or setfill pattern.

18) FLOODFILL

- Flood-fills a bounded region.

Declaration

- Void far floodfill(int x, int y, int border)

Remarks

- Floodfills an enclosed area on bitmap device.
- The area bounded by the color border is flooded with the current fill pattern and fill color.
- (x,y) is a “seed point”

¬ If the seed is within an enclosed area, the inside will be filled.

¬ If the seed is outside the enclosed area, the exterior will be filled.

- Use fillpoly instead of floodfill wherever possible so you can maintain code compatibility with future versions.
- Floodfill doesnot work with the IBM-8514 driver.

Return value

- If an error occurs while flooding a region, graph result returns „1‟.

7) GETCOLOR, SETCOLOR

- Getcolor returns the current drawing color.
- Setcolor returns the current drawing color.

Declaration

- Int far getcolor(void);
- Void far setcolor(int color)

Remarks

- Getcolor returns the current drawing color.
- Setcolor sets the current drawing color to color, which can range from 0 to getmaxcolor.
- To set a drawing color with set color, you can pass either the color number or the equivalent color name.

12) LINE, LINEREL, LINETO

- Line draws a line between two specified pints.
- Onerel draws a line relative distance from current position (CP).
- Linrto draws a line from the current position (CP) to(x,y).
- Void far lineto(int x, int y)

Remarks

- Line draws a line from (x1, y1) to (x2, y2) using the current color, line style and thickness. It does not update the current position (CP).
- Linerel draws a line from the CP to a point that is relative distance (dx, dy) from the CP, then advances the CP by (dx, dy).
- Lineto draws a line from the CP to (x, y), then moves the CP to (x,y).

Return value

- None

13) RECTANGLE

- Draws a rectangle in graphics mode.

Decleration

- Void far rectangle (int left, int top, int right, int bottom)

Remarks

- It draws a rectangle in the current line style, thickness and drawing color.
- (left, top) is the upper left corner of the rectangle, and (right, bottom) is its lower right corner.

Return value

LAB 2: Implementation of line drawing algorithms – DDA(Digital Differential Algorithm)

Algorithm:

```
Step 1. Declare the variables, x1,y1 and x2 , y2 dx, dy ,del x, del y as real and k as integer.
Step 2. Perform
dx = x2-x1
dy = y2 – y1
Step 3. Test if |dy|<|dx| then
        Steps = |dx|
        Else steps = |dy|
Step 4. set del x = dx/steps
        del y = dy/steps
        x= x1
        y = y1
Step 5. Plot (x, y)
Step 6. Do for k = 1 to steps
x = x+ delx
y = y +del y
Plot (x,y)
```

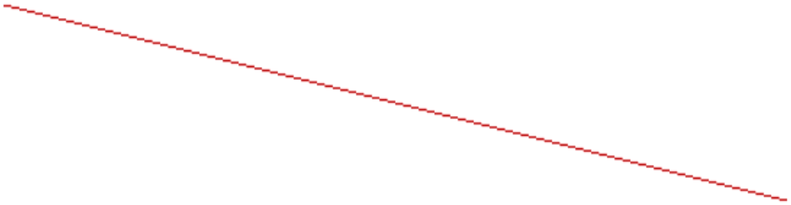
Program using C language:

```
#include<graphics.h>
#include<conio.h>
#include<stdio.h>
void main()
```

```
{
   int gd =  DETECT ,gm, i;
   float x, y,dx,dy,steps;
   int x0, x1, y0, y1;
   initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
   setbkcolor(WHITE);
   x0 = 100 , y0 = 200, x1 = 500, y1 = 300;
   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;
   i = 1;
   while(i<= steps)
   {
         putpixel(x, y, RED);
```

```
        x += dx;

        y += dy;

        i=i+1;

    }

    getch();

    closegraph();

}
```

Output:



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Algorithm:

```
Step1: Start Algorithm

Step2: Declare variable $x_1$, $x_2$, $y_1$, $y_2$, d, $i_1$, $i_2$, dx, dy

Step3: Enter value of $x_1$, $y_1$, $x_2$, $y_2$
        Where x1, y1 are coordinates of starting point
        And $x_2$, $y_2$ are coordinates of Ending point

Step4: Calculate $dx = x_2-x_1$
        Calculate $dy = y_2-y_1$
        Calculate $i_1=2 * dy$
        Calculate $i_2=2 * (dy - dx)$
        Calculate $d=i_1 - dx$

Step5: Consider (x, y) as starting point and $x_{end}$ as maximum possible value of x.
        If $dx < 0$
            Then $x = x_2$
            $y = y_2$
            $x_{end} = x_1$
        If $dx > 0$
          Then $x = x_1$
        $y = y_1$
            $x_{end} = x_2$

Step6: Generate point at (x, y) coordinates.

Step7: Check if whole line is generated.
        If $x > = x_{end}$
        Stop.

Step8: Calculate co-ordinates of the next pixel
        If $d < 0$
          Then $d = d + i_1$
        If $d \geq 0$
     Then $d = d + i_2$
        Increment $y = y + 1$

Step9: Increment $x = x + 1$

Step10: Draw a point of latest (x, y) coordinates
```

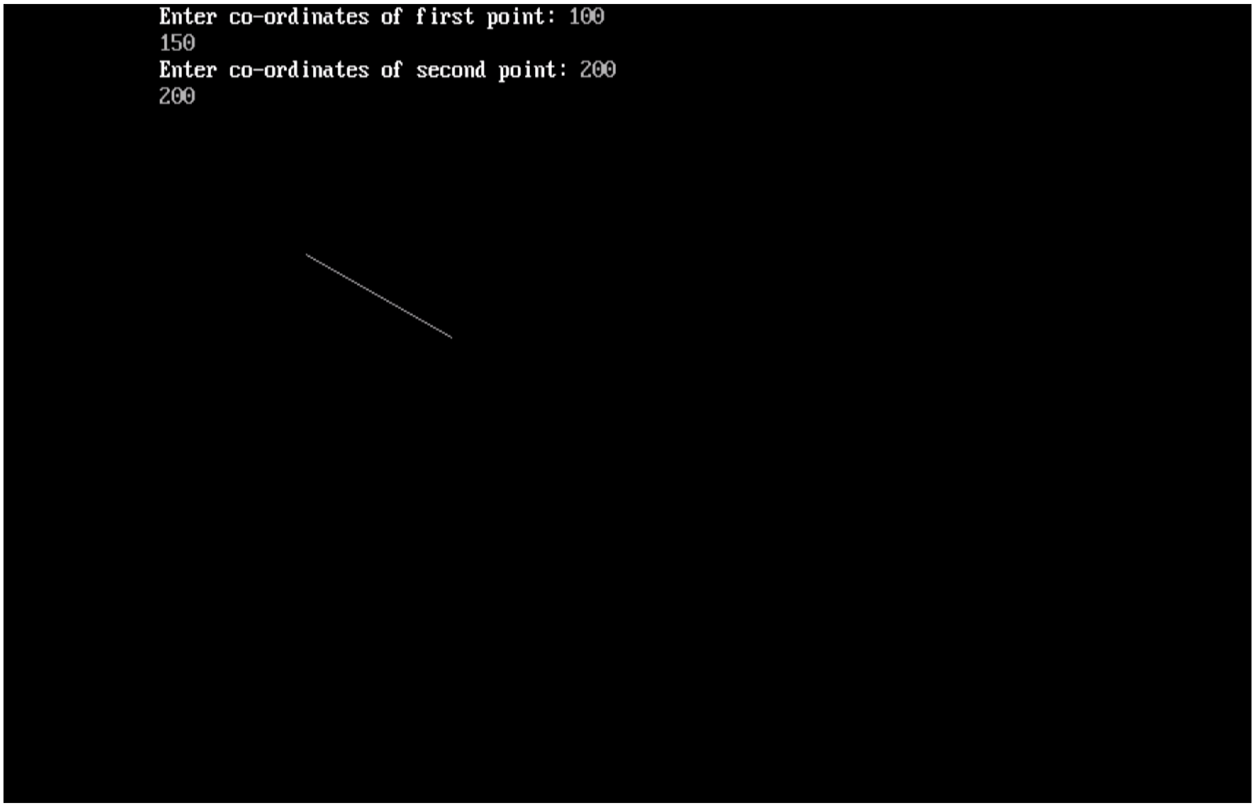
Step11: Go to step 7

Step12: End

Program using C language:

```
#include<stdio.h>

#include<graphics.h>

void drawline(int x0, int y0, int x1, int y1)

{

   int dx, dy, p, x, y;

   dx=x1-x0;

   dy=y1-y0;

   x=x0;

   y=y0;

   p=2*dy-dx;

   while(x<x1)

   {

      if(p>=0) {

         putpixel(x,y,7);

         y=y+1;

         p=p+2*dy-2*dx;

      }

      else {

         putpixel(x,y,7);

         p=p+2*dy;}

         x=x+1;

      }
}

int main()

{

   int gdriver=DETECT, gmode, error, x0, y0, x1, y1;

   initgraph(&gdriver, &gmode, "c:\\turboc3\\bgi");

   printf("Enter co-ordinates of first point: ");

   scanf("%d%d", &x0, &y0);

   printf("Enter co-ordinates of second point: ");

   scanf("%d%d", &x1, &y1);

   drawline(x0, y0, x1, y1);

   return 0;

}
```

Output:



```
Enter co-ordinates of first point: 100
150
Enter co-ordinates of second point: 200
200
```

Lab 1: Introduction to graphics primitive and graphics drivers

d) Software requirement: Turbo C / C++

BASIC GRAPHICS FUNCTION

19) INITGRAPH

- Initializes the graphics system.

Declaration

- Void far initgraph(int far *graphdriver)

Remarks

- To start the graphic system, you must first call initgraph.
- Initgraph initializes the graphic system by loading a graphics driver from disk (or validating a registered driver) then putting the system into graphics mode.
- Initgraph also resets all graphics settings (color, palette, current position, viewport, etc) to their defaults then resets graph.

20) GETPIXEL, PUTPIXEL

- Getpixel gets the color of a specified pixel.
- Putpixel places a pixel at a specified point.

Decleration

- Unsigned far getpixel(int x, int y)
- Void far putpixel(int x, int y, int color)

Remarks

- Getpixel gets the color of the pixel located at (x,y);
- Putpixel plots a point in the color defined at (x, y)

Return value

- Getpixel returns the color of the given pixel.
- Putpixel does not return

21) CLOSE GRAPH

- Shuts down the graphic system.

Declaration

- Void far closegraph(void);

Remarks

- Close graph deallocates all memory allocated by the graphic system.
- It then restores the screen to the mode it was in before you called initgraph.

Return value

- None.

22) ARC, CIRCLE, PIESLICE

- arc draws a circular arc.
- Circle draws a circle
- Pieslice draws and fills a circular pieslice

Declaration

- Void far arc(int x, int y, int stangle, int endangle, int radius);
- Void far circle(int x, int y, int radius);
- Void far pieslice(int x, int y, int stangle, int endangle, int radius);

Remarks

- Arc draws a circular arc in the current drawing color
- Circle draws a circle in the current drawing color
- Pieslice draws a pieslice in the current drawing color, then fills it using the current fill pattern and fill color.

23) ELLIPSE, FILL ELIPSE, SECTOR

- Ellipse draws an elliptical arc.
- Fill ellipse draws and fills ellipse.
- Sector draws and fills an elliptical pie slice.

Declaration

- Void far ellipse (int x, int y, int stangle, int endangle, int xradius, int yradius)
- Void far fill ellipse (int x, int y, int xradius, int yradius)
- Void farsectoe(int x, int y, int stangle, int endangle, int xradius, int yradius)

Remarks

- Ellipse draws an elliptical arc in the current drawing color.
- Fill ellipse draws an elliptical arc in the current drawing color and then fills it with fill color and fill pattern.
- Sector draws an elliptical pie slice in the current drawing color and then fills it using the pattern and color defined by setfill style or setfill pattern.

24) FLOODFILL

- Flood-fills a bounded region.

Declaration

- Void far floodfill(int x, int y, int border)

Remarks

- Floodfills an enclosed area on bitmap device.
- The area bounded by the color border is flooded with the current fill pattern and fill color.
- (x,y) is a “seed point”

¬ If the seed is within an enclosed area, the inside will be filled.

¬ If the seed is outside the enclosed area, the exterior will be filled.

- Use fillpoly instead of floodfill wherever possible so you can maintain code compatibility with future versions.
- Floodfill doesnot work with the IBM-8514 driver.

Return value

- If an error occurs while flooding a region, graph result returns „1‟.

7) GETCOLOR, SETCOLOR

- Getcolor returns the current drawing color.
- Setcolor returns the current drawing color.

Declaration

- Int far getcolor(void);
- Void far setcolor(int color)

Remarks

- Getcolor returns the current drawing color.
- Setcolor sets the current drawing color to color, which can range from 0 to getmaxcolor.
- To set a drawing color with set color, you can pass either the color number or the equivalent color name.

14) LINE, LINEREL, LINETO

- Line draws a line between two specified pints.
- Onerel draws a line relative distance from current position (CP).
- Linrto draws a line from the current position (CP) to(x,y).
- Void far lineto(int x, int y)

Remarks

- Line draws a line from (x1, y1) to (x2, y2) using the current color, line style and thickness. It does not update the current position (CP).
- Linerel draws a line from the CP to a point that is relative distance (dx, dy) from the CP, then advances the CP by (dx, dy).
- Lineto draws a line from the CP to (x, y), then moves the CP to (x,y).

Return value

- None

15) RECTANGLE

- Draws a rectangle in graphics mode.

Decleration

- Void far rectangle (int left, int top, int right, int bottom)

Remarks

- It draws a rectangle in the current line style, thickness and drawing color.
- (left, top) is the upper left corner of the rectangle, and (right, bottom) is its lower right corner.

Return value

LAB 2: Implementation of line drawing algorithms – DDA(Digital Differential Algorithm)

Algorithm:

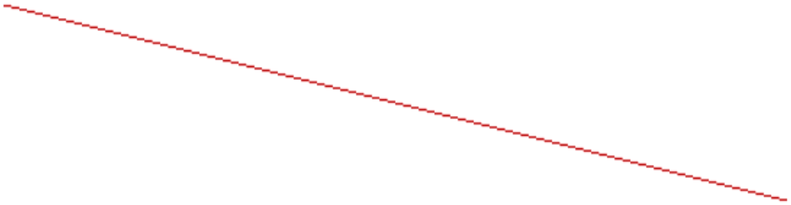
```
Step 1. Declare the variables, x1,y1 and x2 , y2 dx, dy ,del x, del y as real and k as integer.

Step 2. Perform

dx = x2-x1

dy = y2 – y1

Step 3. Test if |dy|<|dx| then

        Steps = |dx|

        Else steps = |dy|

Step 4. set del x = dx/steps

        del y = dy/steps

        x= x1

        y = y1

Step 5. Plot (x, y)

Step 6. Do for k = 1 to steps

x = x+ delx

y = y +del y

Plot (x,y)
```

Program using C language:

```
#include<graphics.h>

#include<conio.h>

#include<stdio.h>

void main()
```

```
{
    int gd =  DETECT ,gm, i;
    float x, y,dx,dy,steps;
    int x0, x1, y0, y1;
    initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
    setbkcolor(WHITE);
    x0 = 100 , y0 = 200, x1 = 500, y1 = 300;
    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;
    i = 1;
    while(i<= steps)
    {
            putpixel(x, y, RED);
            x += dx;

            y += dy;

            i=i+1;

    }

    getch();

    closegraph();

}
```

Output:



LAB 3: Implementation of line drawing algorithms – Bresenham's Line Algorithm

Algorithm:

```
Step1: Start Algorithm

Step2: Declare variable $x_1$, $x_2$, $y_1$, $y_2$, d, $i_1$, $i_2$, dx, dy

Step3: Enter value of $x_1$, $y_1$, $x_2$, $y_2$
    Where x1,y1 are coordinates of starting point
    And $x_2$,$y_2$ are coordinates of Ending point

Step4: Calculate $dx = x_2-x_1$
    Calculate $dy = y_2-y_1$
    Calculate $i_1=2 * dy$
    Calculate $i_2=2 * (dy - dx)$
    Calculate $d=i_1 - dx$

Step5: Consider (x, y) as starting point and $x_{end}$ as maximum possible value of x.
    If $dx < 0$
        Then $x = x_2$
        $y = y_2$
        $x_{end} = x_1$
    If $dx > 0$
      Then $x = x_1$
    $y = y_1$
        $x_{end} = x_2$

Step6: Generate point at (x, y) coordinates.

Step7: Check if whole line is generated.
    If $x > = x_{end}$
    Stop.

Step8: Calculate co-ordinates of the next pixel
    If $d < 0$
      Then $d = d + i_1$
    If $d \geq 0$
  Then $d = d + i_2$
    Increment $y = y + 1$

Step9: Increment $x = x + 1$

Step10: Draw a point of latest (x, y) coordinates
```

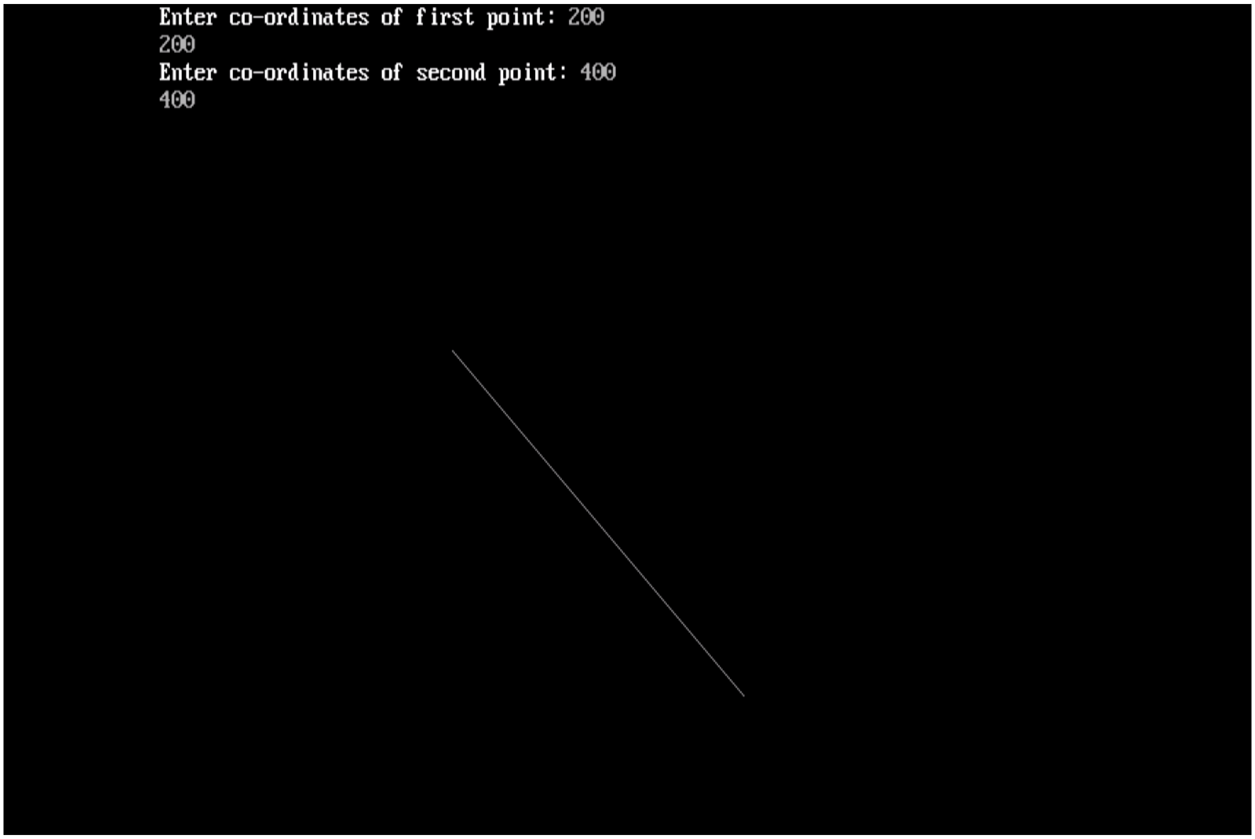
Step11: Go to step 7

Step12: End

Program using C language:

```
#include<stdio.h>

#include<graphics.h>

void drawline(int x0, int y0, int x1, int y1)

{

   int dx, dy, p, x, y;

   dx=x1-x0;

   dy=y1-y0;

   x=x0;

   y=y0;

   p=2*dy-dx;

   while(x<x1)

   {

      if(p>=0) {

         putpixel(x,y,7);

         y=y+1;

         p=p+2*dy-2*dx;

      }

      else {

         putpixel(x,y,7);

         p=p+2*dy;}

         x=x+1;

      }
}
int main()
{
   int gdriver=DETECT, gmode, error, x0, y0, x1, y1;
   initgraph(&gdriver, &gmode, "c:\\turboc3\\bgi");
   printf("Enter co-ordinates of first point: ");
   scanf("%d%d", &x0, &y0);
   printf("Enter co-ordinates of second point: ");
   scanf("%d%d", &x1, &y1);
   drawline(x0, y0, x1, y1);
   return 0;
}
```

Output:



```
Enter co-ordinates of first point: 200
200
Enter co-ordinates of second point: 400
400
```

Lab 1: Introduction to graphics primitive and graphics drivers

e) Software requirement: Turbo C / C++

BASIC GRAPHICS FUNCTION

25) INITGRAPH

- Initializes the graphics system.

Declaration

- Void far initgraph(int far *graphdriver)

Remarks

- To start the graphic system, you must first call initgraph.
- Initgraph initializes the graphic system by loading a graphics driver from disk (or validating a registered driver) then putting the system into graphics mode.
- Initgraph also resets all graphics settings (color, palette, current position, viewport, etc) to their defaults then resets graph.

26) GETPIXEL, PUTPIXEL

- Getpixel gets the color of a specified pixel.
- Putpixel places a pixel at a specified point.

Decleration

- Unsigned far getpixel(int x, int y)
- Void far putpixel(int x, int y, int color)

Remarks

- Getpixel gets the color of the pixel located at (x,y);
- Putpixel plots a point in the color defined at (x, y)

Return value

- Getpixel returns the color of the given pixel.
- Putpixel does not return

27) CLOSE GRAPH

- Shuts down the graphic system.

Declaration

- Void far closegraph(void);

Remarks

- Close graph deallocates all memory allocated by the graphic system.
- It then restores the screen to the mode it was in before you called initgraph.

Return value

- None.

28) ARC, CIRCLE, PIESLICE

- arc draws a circular arc.
- Circle draws a circle
- Pieslice draws and fills a circular pieslice

Declaration

- Void far arc(int x, int y, int stangle, int endangle, int radius);
- Void far circle(int x, int y, int radius);
- Void far pieslice(int x, int y, int stangle, int endangle, int radius);

Remarks

- Arc draws a circular arc in the current drawing color
- Circle draws a circle in the current drawing color
- Pieslice draws a pieslice in the current drawing color, then fills it using the current fill pattern and fill color.

29) ELLIPSE, FILL ELIPSE, SECTOR

- Ellipse draws an elliptical arc.
- Fill ellipse draws and fills ellipse.
- Sector draws and fills an elliptical pie slice.

Declaration

- Void far ellipse (int x, int y, int stangle, int endangle, int xradius, int yradius)
- Void far fill ellipse (int x, int y, int xradius, int yradius)
- Void farsectoe(int x, int y, int stangle, int endangle, int xradius, int yradius)

Remarks

- Ellipse draws an elliptical arc in the current drawing color.
- Fill ellipse draws an elliptical arc in the current drawing color and then fills it with fill color and fill pattern.
- Sector draws an elliptical pie slice in the current drawing color and then fills it using the pattern and color defined by setfill style or setfill pattern.

30) FLOODFILL

- Flood-fills a bounded region.

Declaration

- Void far floodfill(int x, int y, int border)

Remarks

- Floodfills an enclosed area on bitmap device.
- The area bounded by the color border is flooded with the current fill pattern and fill color.
- (x,y) is a “seed point”

¬ If the seed is within an enclosed area, the inside will be filled.

¬ If the seed is outside the enclosed area, the exterior will be filled.

- Use fillpoly instead of floodfill wherever possible so you can maintain code compatibility with future versions.
- Floodfill doesnot work with the IBM-8514 driver.

Return value

- If an error occurs while flooding a region, graph result returns „1‟.

7) GETCOLOR, SETCOLOR

- Getcolor returns the current drawing color.
- Setcolor returns the current drawing color.

Declaration

- Int far getcolor(void);
- Void far setcolor(int color)

Remarks

- Getcolor returns the current drawing color.
- Setcolor sets the current drawing color to color, which can range from 0 to getmaxcolor.
- To set a drawing color with set color, you can pass either the color number or the equivalent color name.

16) LINE, LINEREL, LINETO

- Line draws a line between two specified pints.
- Onerel draws a line relative distance from current position (CP).
- Linrto draws a line from the current position (CP) to(x,y).
- Void far lineto(int x, int y)

Remarks

- Line draws a line from (x1, y1) to (x2, y2) using the current color, line style and thickness. It does not update the current position (CP).
- Linerel draws a line from the CP to a point that is relative distance (dx, dy) from the CP, then advances the CP by (dx, dy).
- Lineto draws a line from the CP to (x, y), then moves the CP to (x,y).

Return value

- None

17) RECTANGLE

- Draws a rectangle in graphics mode.

Decleration

- Void far rectangle (int left, int top, int right, int bottom)

Remarks

- It draws a rectangle in the current line style, thickness and drawing color.
- (left, top) is the upper left corner of the rectangle, and (right, bottom) is its lower right corner.

Return value

LAB 2: Implementation of line drawing algorithms – DDA(Digital Differential Algorithm)

Algorithm:

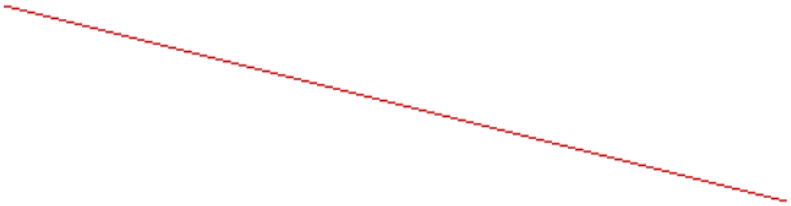
```
Step 1. Declare the variables, x1,y1 and x2 , y2 dx, dy ,del x, del y as real and k as integer.

Step 2. Perform

dx = x2-x1

dy = y2 – y1

Step 3. Test if |dy|<|dx| then

        Steps = |dx|

        Else steps = |dy|

Step 4. set del x = dx/steps

        del y = dy/steps

        x= x1

        y = y1

Step 5. Plot (x, y)

Step 6. Do for k = 1 to steps

x = x+ delx

y = y +del y

Plot (x,y)
```

Program using C language:

```
#include<graphics.h>

#include<conio.h>

#include<stdio.h>

void main()
```

```
{
    int gd =  DETECT ,gm, i;
    float x, y,dx,dy,steps;
    int x0, x1, y0, y1;
    initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
    setbkcolor(WHITE);
    x0 = 100 , y0 = 200, x1 = 500, y1 = 300;
    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;
    i = 1;
    while(i<= steps)
    {
        putpixel(x, y, RED);
        x += dx;
        y += dy;
        i=i+1;
    }
    getch();
    closegraph();
}
```

Output:



LAB 3: Implementation of line drawing algorithms – Bresenham's Line Algorithm

Algorithm:

```
Step1: Start Algorithm

Step2: Declare variable $x_1$, $x_2$, $y_1$, $y_2$, d, $i_1$, $i_2$, dx, dy

Step3: Enter value of $x_1$, $y_1$, $x_2$, $y_2$
            Where $x_1$, $y_1$ are coordinates of starting point
            And $x_2$, $y_2$ are coordinates of Ending point

Step4: Calculate $dx = x_2-x_1$
            Calculate $dy = y_2-y_1$
            Calculate $i_1=2 * dy$
            Calculate $i_2=2 * (dy - dx)$
            Calculate $d=i_1 - dx$

Step5: Consider (x, y) as starting point and $x_{end}$ as maximum possible value of x.
            If $dx < 0$
                  Then $x = x_2$
                  $y = y_2$
                  $x_{end} = x_1$
            If $dx > 0$
               Then $x = x_1$
            $y = y_1$
                  $x_{end} = x_2$

Step6: Generate point at (x, y) coordinates.

Step7: Check if whole line is generated.
            If $x > = x_{end}$
            Stop.

Step8: Calculate co-ordinates of the next pixel
            If $d < 0$
               Then $d = d + i_1$
            If $d \geq 0$
       Then $d = d + i_2$
            Increment $y = y + 1$

Step9: Increment $x = x + 1$

Step10: Draw a point of latest (x, y) coordinates
```

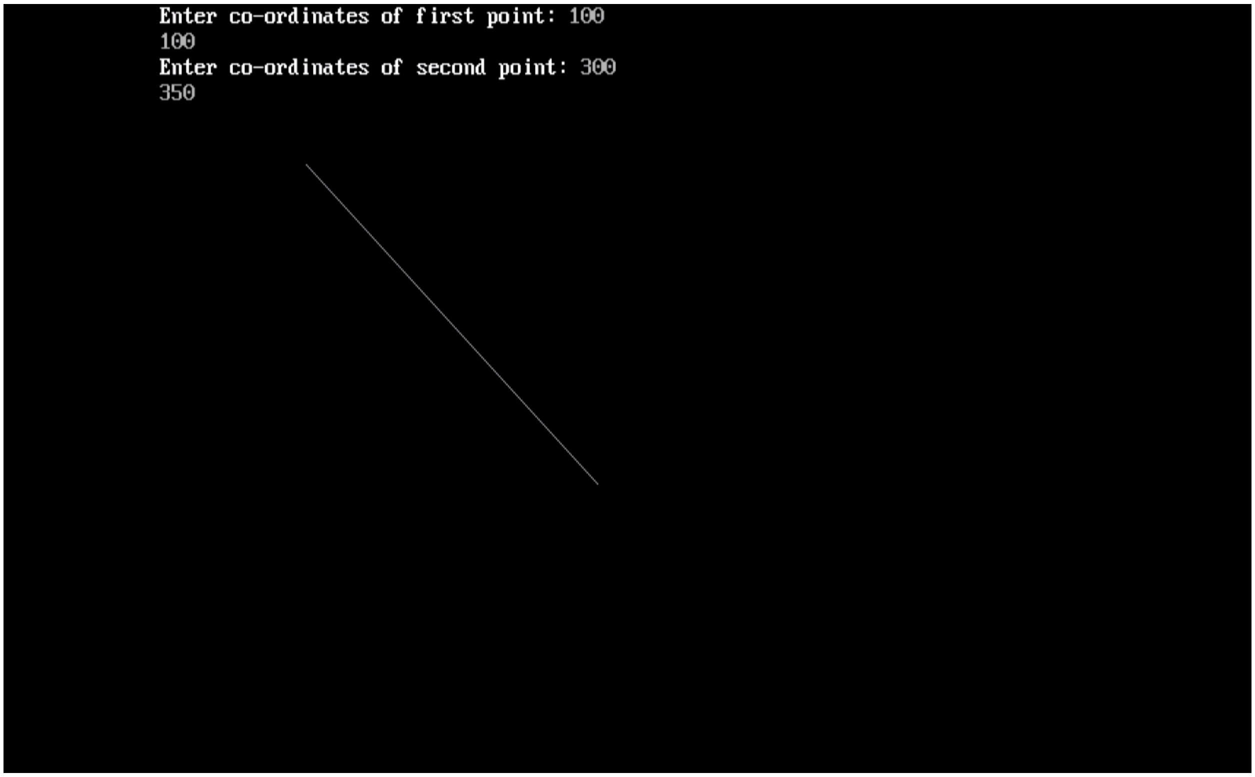
Step11: Go to step 7

Step12: End

Program using C language:

```
#include<stdio.h>
#include<graphics.h>
void drawline(int x0, int y0, int x1, int y1)
{
    int dx, dy, p, x, y;
    dx=x1-x0;
    dy=y1-y0;
    x=x0;
    y=y0;
    p=2*dy-dx;
    while(x<x1)
    {
        if(p>=0) {
            putpixel(x,y,7);
            y=y+1;
            p=p+2*dy-2*dx;
        }
        else {
            putpixel(x,y,7);
            p=p+2*dy;}
            x=x+1;
        }
}
int main()
{
    int gdriver=DETECT, gmode, error, x0, y0, x1, y1;
    initgraph(&gdriver, &gmode, "c:\\turboc3\\bgi");
    printf("Enter co-ordinates of first point: ");
    scanf("%d%d", &x0, &y0);
    printf("Enter co-ordinates of second point: ");
    scanf("%d%d", &x1, &y1);
    drawline(x0, y0, x1, y1);
    return 0;
}
```

Output:



```
Enter co-ordinates of first point: 100
100
Enter co-ordinates of second point: 300
350
```