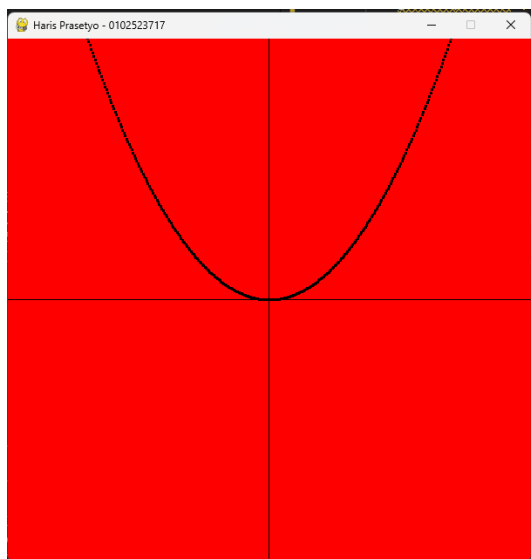


Tugas 4

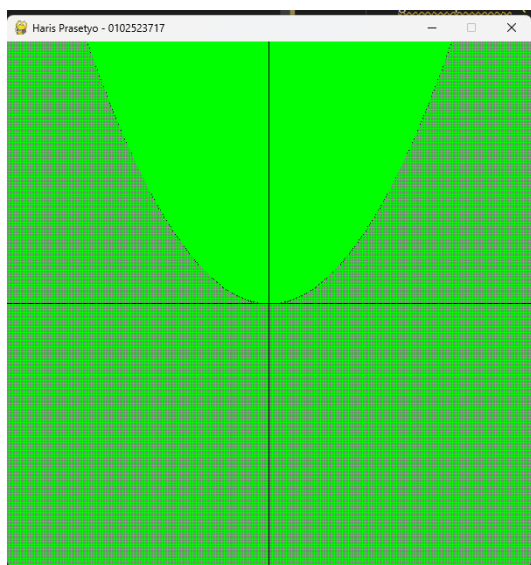
Latihan 4_1.py

```
1 import pygame
2 from pygame.locals import *
3 import numpy as np
4 import math
5
6 from OpenGL.GL import *
7 from OpenGL.GLU import *
8 from OpenGL.GLUT import *
9
10 def init():
11     glClearColor(1,0,0, 1);
12
13 def plotFunc() :
14     glClear(GL_COLOR_BUFFER_BIT)
15     glColor3f(0.0, 0.0, 0.0)
16     glPointSize(3.0)
17     glBegin(GL_LINES)
18     glVertex2f(-5.0, 0.0)
19     glVertex2f(5.0, 0.0)
20     glVertex2f(0.0, 5.0)
21     glVertex2f(0.0, -5.0)
22     glEnd()
23     for x in np.arange(-5.0, 5.0, 0.01):
24         y = x*x
25         glBegin(GL_POINTS)
26         glVertex2f(x,y)
27         #pygame.time.wait(50)
28     glEnd()
29     glFlush()
30
31 def main():
32     pygame.init()
33     display = (600,600)
34     pygame.display.set_caption ('Haris Prasetyo - 0102523717')
35     pygame.display.set_mode (display, DOUBLEBUF | OPENGL)
36     gluPerspective (45, (display [0]/display [1]), 0.1, 50.0)
37     # glutInitWindowSize(800, 600); # Set dimensi jendela
38     glTranslatef (0.0,0.0, -5)
39     glClearColor(1.0, 0.0, 0.0, 1.0)
40     init()
41     while True:
42         for event in pygame.event.get():
43             if event.type == pygame.QUIT:
44                 pygame.quit()
45                 quit ()
46         glClear (GL_COLOR_BUFFER_BIT| GL_DEPTH_BUFFER_BIT)
47         plotFunc()
48         pygame.display.flip()
49         pygame.time.wait (10)
50 main()
```



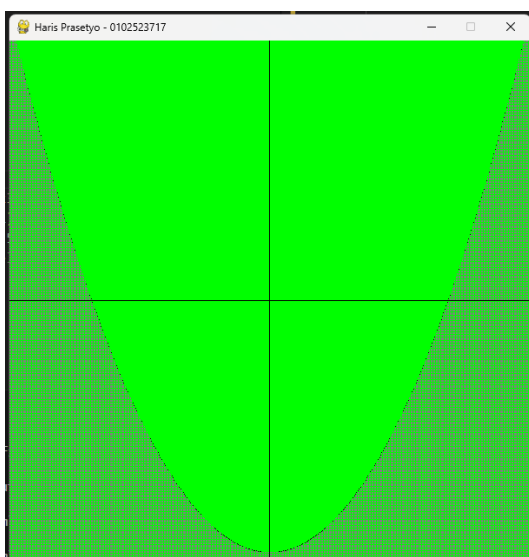
Latihan 4_2.py

```
1 import pygame
2 from pygame.locals import *
3 import numpy as np
4 import math
5
6 from OpenGL.GL import *
7 from OpenGL.GLU import *
8 from OpenGL.GLUT import *
9
10 def init():
11     glClearColor(0,1,0, 1);
12
13 def plotFunc() :
14     glClear(GL_COLOR_BUFFER_BIT)
15     glColor3f(0.0, 0.0, 0.0)
16     glPointSize(1.0)
17     for x in np.arange(-5.0, 5.0, 0.01):
18         y = x*x
19         glColor3f(0.0, 0.0, 0.0)
20         glBegin(GL_POINTS)
21             glVertex2f(x,y)
22         glEnd()
23     for a in np.arange(-5.0, 5.0, 0.01):
24         if a < x*x:
25             glColor3f(0.50,0.50,0.50)
26             glBegin(GL_POINTS)
27                 glVertex2f(x,a)
28             glEnd()
29             glColor3f(0.0, 0.0, 0.0)
30     glBegin(GL_LINES)
31         glVertex2f(-5.0, 0.0)
32         glVertex2f(5.0, 0.0)
33         glVertex2f(0.0, 5.0)
34         glVertex2f(0.0, -5.0)
35     glEnd()
36     glFlush()
37
38 def main():
39     pygame.init()
40     display = (600,600)
41     pygame.display.set_caption ('Haris Prasetyo - 0102523717')
42     pygame.display.set_mode (display, DOUBLEBUF | OPENGL)
43     gluPerspective (45, (display [0]/display [1]), 0.1, 50.0)
44     # glutInitWindowSize(800, 600); # Set dimensi jendela
45     glTranslatef (0.0,0.0, -5)
46     init()
47     while True:
48         for event in pygame.event.get():
49             if event.type == pygame.QUIT:
50                 pygame.quit()
51                 quit ()
52         glClear (GL_COLOR_BUFFER_BIT| GL_DEPTH_BUFFER_BIT)
53         plotFunc()
54         pygame.display.flip()
55         pygame.time.wait (10)
56
57 main()
```



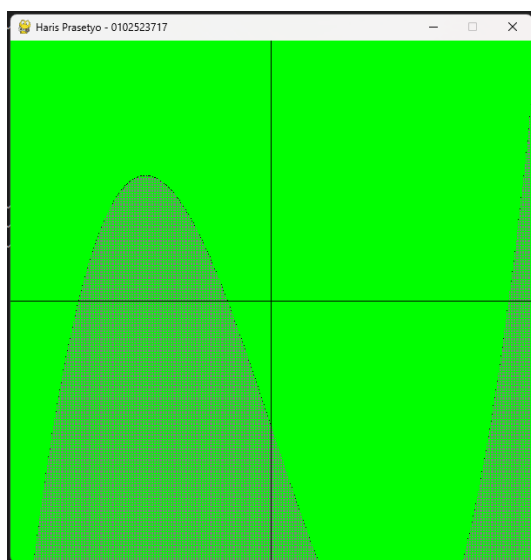
$$y < x^2 - 2$$

```
1 import pygame
2 from pygame.locals import *
3 import numpy as np
4 import math
5
6 from OpenGL.GL import *
7 from OpenGL.GLU import *
8 from OpenGL.GLUT import *
9
10 def init():
11     glClearColor(0,1,0, 1);
12
13 def plotFunc1() :
14     glClear(GL_COLOR_BUFFER_BIT)
15     glColor3f(0.0, 0.0, 0.0)
16     glPointSize(1.0)
17     for x in np.arange(-5.0, 5.0, 0.01):
18         y = x*x - 2
19         glColor3f(0.0, 0.0, 0.0)
20         glBegin(GL_POINTS)
21         glVertex2f(x,y)
22         glEnd()
23     for a in np.arange(-5.0, 5.0, 0.01):
24         if a < ((x*x) - 2):
25             glColor3f(0.50,0.50,0.50)
26             glBegin(GL_POINTS)
27             glVertex2f(x,a)
28             glEnd()
29             glColor3f(0.0, 0.0, 0.0)
30     glBegin(GL_LINES)
31     glVertex2f(-5.0, 0.0)
32     glVertex2f(5.0, 0.0)
33     glVertex2f(0.0, 5.0)
34     glVertex2f(0.0, -5.0)
35     glEnd()
36     glFlush()
37
38 def main():
39     pygame.init()
40     display = (600,600)
41     pygame.display.set_caption ('Haris Prasetyo - 0102523717')
42     pygame.display.set_mode (display, DOUBLEBUF | OPENGL)
43     gluPerspective (45, (display [0]/display [1]), 0.1, 50.0)
44     # glutInitWindowSize(800, 600); # Set dimensi jendela
45     glTranslatef (0.0,0.0, -5)
46     init()
47     while True:
48         for event in pygame.event.get():
49             if event.type == pygame.QUIT:
50                 pygame.quit()
51                 quit ()
52         glClear (GL_COLOR_BUFFER_BIT| GL_DEPTH_BUFFER_BIT)
53         plotFunc1()
54         pygame.display.flip()
55         pygame.time.wait (10)
56
57 main()
```



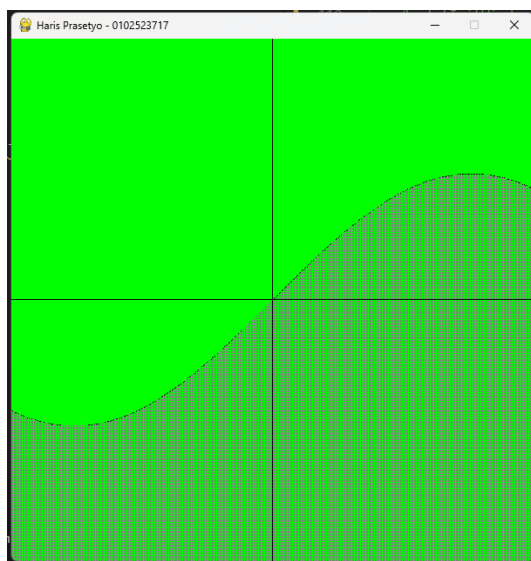
$$y = x^3 - 3x - 2$$

```
1  import pygame
2  from pygame.locals import *
3  import numpy as np
4  import math
5
6  from OpenGL.GL import *
7  from OpenGL.GLU import *
8  from OpenGL.GLUT import *
9
10 def init():
11     glClearColor(0,1,0, 1);
12
13 def plotFunc2() :
14     glClear(GL_COLOR_BUFFER_BIT)
15     glColor3f(0.0, 0.0, 0.0)
16     glPointSize(1.0)
17     for x in np.arange(-5.0, 5.0, 0.01):
18         y = x*x*x - 3*x - 1
19         glColor3f(0.0, 0.0, 0.0)
20         glBegin(GL_POINTS)
21         glVertex2f(x,y)
22         glEnd()
23     for a in np.arange(-5.0, 5.0, 0.01):
24         if a < (y):
25             glColor3f(0.50,0.50,0.50)
26             glBegin(GL_POINTS)
27             glVertex2f(x,a)
28             glEnd()
29             glColor3f(0.0, 0.0, 0.0)
30     glBegin(GL_LINES)
31     glVertex2f(-5.0, 0.0)
32     glVertex2f(5.0, 0.0)
33     glVertex2f(0.0, 5.0)
34     glVertex2f(0.0, -5.0)
35     glEnd()
36     glFlush()
37
38 def main():
39     pygame.init()
40     display = (600,600)
41     pygame.display.set_caption ('Haris Prasetyo - 0102523717')
42     pygame.display.set_mode (display, DOUBLEBUF | OPENGL)
43     gluPerspective (45, (display [0]/display [1]), 0.1, 50.0)
44     # glutInitWindowSize(800, 600); # Set dimensi jendela
45     glTranslatef (0.0,0.0, -5)
46     init()
47     while True:
48         for event in pygame.event.get():
49             if event.type == pygame.QUIT:
50                 pygame.quit()
51                 quit ()
52             glClear (GL_COLOR_BUFFER_BIT| GL_DEPTH_BUFFER_BIT)
53             plotFunc2()
54             pygame.display.flip()
55             pygame.time.wait (10)
56
57 main()
```



$$y = \sin(x)$$

```
1 import pygame
2 from pygame.locals import *
3 import numpy as np
4 import math
5
6 from OpenGL.GL import *
7 from OpenGL.GLU import *
8 from OpenGL.GLUT import *
9
10 def init():
11     glClearColor(0,1,0, 1);
12
13 def plotFunc() :
14     glClear(GL_COLOR_BUFFER_BIT)
15     glColor3f(0.0, 0.0, 0.0)
16     glPointSize(1.0)
17     for x in np.arange(-5.0, 5.0, 0.01):
18         y = np.sin(x)
19         glColor3f(0.0, 0.0, 0.0)
20         glBegin(GL_POINTS)
21         glVertex2f(x,y)
22         glEnd()
23     for a in np.arange(-5.0, 5.0, 0.01):
24         if a < (y):
25             glColor3f(0.50,0.50,0.50)
26             glBegin(GL_POINTS)
27             glVertex2f(x,a)
28             glEnd()
29             glColor3f(0.0, 0.0, 0.0)
30     glBegin(GL_LINES)
31     glVertex2f(-5.0, 0.0)
32     glVertex2f(5.0, 0.0)
33     glVertex2f(0.0, 5.0)
34     glVertex2f(0.0, -5.0)
35     glEnd()
36     glFlush()
37
38 def main():
39     pygame.init()
40     display = (600,600)
41     pygame.display.set_caption ('Haris Prasetyo - 0102523717')
42     pygame.display.set_mode (display, DOUBLEBUF | OPENGL)
43     gluPerspective (45, (display [0]/display [1]), 0.1, 50.0)
44     glTranslatef (0.0,0.0, -5)
45     init()
46     while True:
47         for event in pygame.event.get():
48             if event.type == pygame.QUIT:
49                 pygame.quit()
50                 quit ()
51         glClear (GL_COLOR_BUFFER_BIT| GL_DEPTH_BUFFER_BIT)
52         plotFunc()
53         pygame.display.flip()
54         pygame.time.wait (10)
55
56 main()
```



Kesimpulan : Kita dapat membuat kurva pada bidang kartesian dengan menyambungkan titik kordinat x dan y sehingga membentuk garis sebagai penentuan bidang yang diarsir berdasarkan grafik yang dibuat.

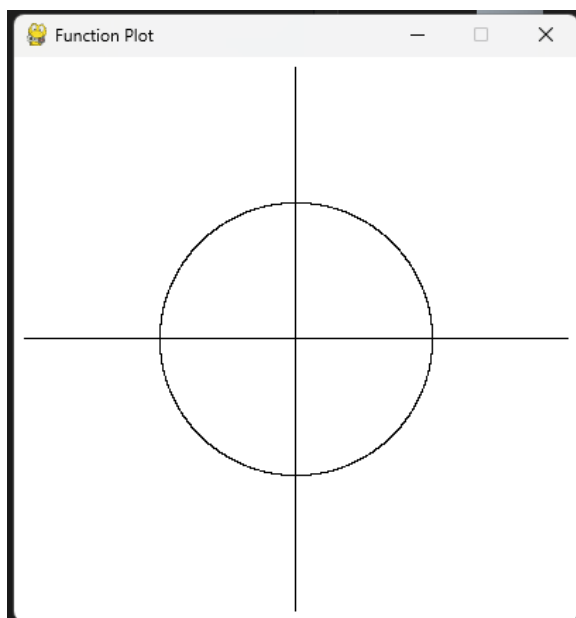
Tugas 5

1. Sebuah lingkaran

```

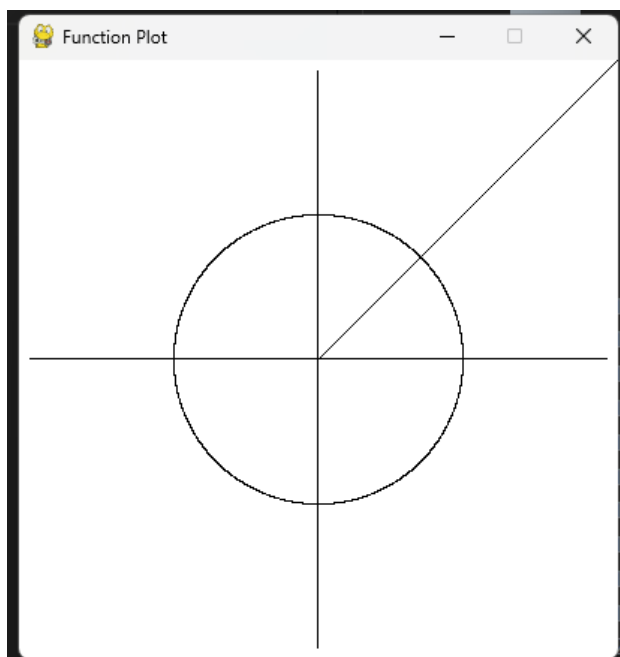
1 import pygame
2 from pygame.locals import *
3 from OpenGL.GL import *
4 from OpenGL.GLU import *
5 import numpy as np
6 import math
7
8 def plotfunc():
9     glClear(GL_COLOR_BUFFER_BIT)
10    glColor3f(0.0, 0.0, 0.0)
11    glPointSize(1.0)
12    glBegin(GL_LINES)
13    glVertex2f(-2.0, 0.0)
14    glVertex2f(2.0, 0.0)
15    glVertex2f(0.0, 2.0)
16    glVertex2f(0.0, -2.0)
17    glEnd()
18    for t in np.arange(-5.0, 6.28, 0.001):
19        x = math.sin(t)
20        y = math.cos(t)
21        glBegin(GL_POINTS)
22        glVertex2f(x,y)
23        glEnd()
24        glFlush()
25
26 def main():
27     pygame.init()
28     display = (400,400)
29     pygame.display.set_caption('Function Plot')
30     pygame.display.set_mode(display, DOUBLEBUF|OPENGL)
31     gluPerspective(45, (display[0]/display[1]), 0.1, 50.0)
32     glTranslatef(0.0,0.0, -5)
33     glClearColor(1.0, 1.0, 1.0, 1.0)
34     while True:
35         for event in pygame.event.get():
36             if event.type == pygame.QUIT:
37                 pygame.quit()
38                 quit()
39         glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT)
40         plotfunc()
41         pygame.display.flip()
42         pygame.time.wait(10)
43
44     main()

```



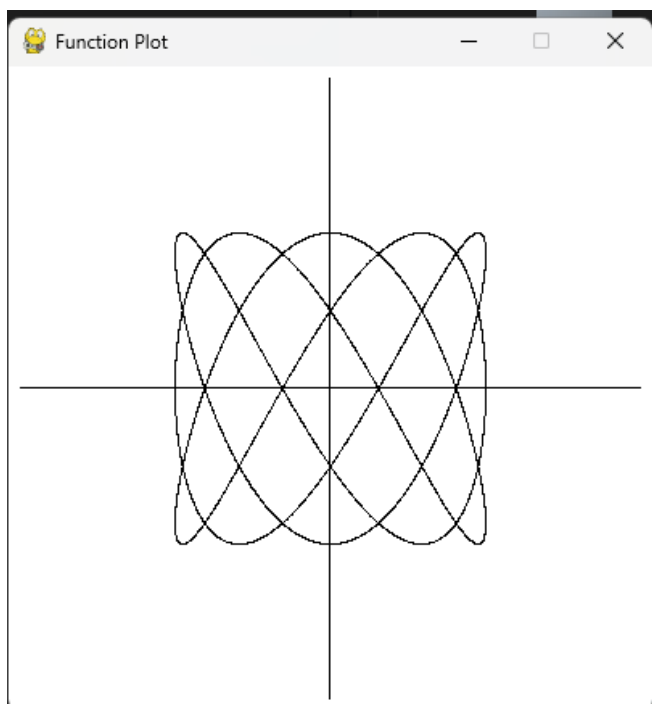
2. $y=x$ (memotong pusat lingkaran)

```
1 import pygame
2 from pygame.locals import *
3 from OpenGL.GL import *
4 from OpenGL.GLU import *
5 import numpy as np
6 import math
7
8 def plotfunc():
9     glClear(GL_COLOR_BUFFER_BIT)
10    glColor3f(0.0, 0.0, 0.0)
11    glPointSize(1.0)
12    glBegin(GL_LINES)
13    glVertex2f(-2.0, 0.0)
14    glVertex2f(2.0, 0.0)
15    glVertex2f(0.0, 2.0)
16    glVertex2f(0.0, -2.0)
17    glEnd()
18    for t in np.arange(0.0, 6.28, 0.001):
19        x = math.sin(t)
20        y = math.cos(t)
21        z = t
22        glBegin(GL_POINTS)
23        glVertex2f(x,y)
24        glVertex2f(t,z)
25    glEnd()
26    glFlush()
27
28 def main():
29     pygame.init()
30     display = (400,400)
31     pygame.display.set_caption('Function Plot')
32     pygame.display.set_mode(display, DOUBLEBUF|OPENGL)
33     gluPerspective(45, (display[0]/display[1]), 0.1, 50.0)
34     glTranslatef(0.0,0.0, -5)
35     glClearColor(1.0, 1.0, 1.0, 1.0)
36     while True:
37         for event in pygame.event.get():
38             if event.type == pygame.QUIT:
39                 pygame.quit()
40                 quit()
41         glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT)
42         plotfunc()
43         pygame.display.flip()
44         pygame.time.wait(10)
45
46 main()
```



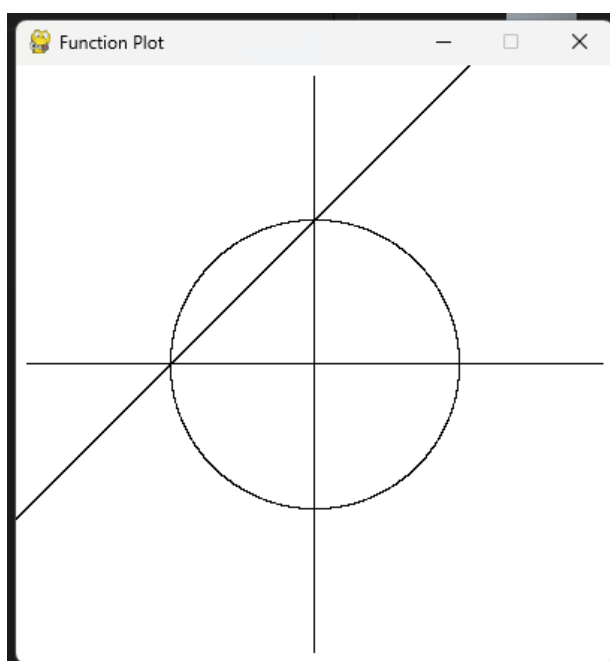
3. Lingkaran dengan batas tertentu

```
1 import pygame
2 from pygame.locals import *
3 from OpenGL.GL import *
4 from OpenGL.GLU import *
5 import numpy as np
6 import math
7
8 def plotfunc():
9     glClear(GL_COLOR_BUFFER_BIT)
10    glColor3f(0.0, 0.0, 0.0)
11    glPointSize(1.0)
12    glBegin(GL_LINES)
13    glVertex2f(-2.0, 0.0)
14    glVertex2f(2.0, 0.0)
15    glVertex2f(0.0, 2.0)
16    glVertex2f(0.0, -2.0)
17    glEnd()
18    for t in np.arange(0.0, 6.28, 0.001):
19        x = math.sin(3*t)
20        y = math.cos(5*t)
21        z = t
22        glBegin(GL_POINTS)
23        glVertex2f(x,y)
24        glEnd()
25    glFlush()
26
27 def main():
28     pygame.init()
29     display = (400,400)
30     pygame.display.set_caption('Function Plot')
31     pygame.display.set_mode(display, DOUBLEBUF|OPENGL)
32     gluPerspective(45, (display[0]/display[1]), 0.1, 50.0)
33     glTranslatef(0.0,0.0, -5)
34     glClearColor(1.0, 1.0, 1.0, 1.0)
35     while True:
36         for event in pygame.event.get():
37             if event.type == pygame.QUIT:
38                 pygame.quit()
39                 quit()
40         glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT)
41         plotfunc()
42         pygame.display.flip()
43         pygame.time.wait(10)
44
45 main()
```



4. Persamaan garis yang baru, dengan menggeser pada sumbu y yang menghasilkan output sbb

```
1 import pygame
2 from pygame.locals import *
3 from OpenGL.GL import *
4 from OpenGL.GLU import *
5 import numpy as np
6 import math
7
8 def plotfunc():
9     glClear(GL_COLOR_BUFFER_BIT)
10    glColor3f(0.0, 0.0, 0.0)
11    glPointSize(1.0)
12    glBegin(GL_LINES)
13    glVertex2f(-2.0, 0.0)
14    glVertex2f(2.0, 0.0)
15    glVertex2f(0.0, 2.0)
16    glVertex2f(0.0, -2.0)
17    glEnd()
18    for t in np.arange(-5.0, 6.28, 0.001):
19        x = math.sin(t)
20        y = math.cos(t)
21        z = t + 1
22        glBegin(GL_POINTS)
23        glVertex2f(x,y)
24        glVertex2f(t,z)
25        glEnd()
26    glFlush()
27
28 def main():
29     pygame.init()
30     display = (400,400)
31     pygame.display.set_caption('Function Plot')
32     pygame.display.set_mode(display, DOUBLEBUF|OPENGL)
33     gluPerspective(45, (display[0]/display[1]), 0.1, 50.0)
34     glTranslatef(0.0,0.0, -5)
35     glClearColor(1.0, 1.0, 1.0, 1.0)
36     while True:
37         for event in pygame.event.get():
38             if event.type == pygame.QUIT:
39                 pygame.quit()
40                 quit()
41         glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT)
42         plotfunc()
43         pygame.display.flip()
44         pygame.time.wait(10)
45     main()
```



5. Kesimpulan dari latihan pada Modul 5

Kita dapat membuat kurva lingkaran dari fungsi parametrik pada kordinat kartesian