TUGAS POLINOMIAL CHAPTER 15

Tugas Mata Kuliah SK5003 Pemrograman dalam Sains
Numpy Python 3

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Soal

15.1 Develop a Python program to evaluate polynomial function $y = x^4 + 4x^2 + 7$. Find an appropriate interval of x for which the function evaluation is done and plot the graph.

15.4 Develop a Python program to solve the polynomial function $y = x^4 + 4x^2 + 7$.

Jawab

Untuk menyelesaikan soal ini (menghitung nilai x dan $y = f(x)$ lalu menggambar dan mencari akar), saya akan gunakan program *Python* berikut ini:

```
# SOAL 15.1

import numpy as np
from numpy.polynomial.polynomial import polyval
from numpy.polynomial.polynomial import polyroots
import matplotlib.pyplot as plt

# pecah data menjadi 30 selang
# initial condition
M = 30     # number of data points
xi = -5.0  # first value of x
xf = 5.0   # final value

# membuat x dan y = f(x)
x = np.linspace(xi, xf, M)

# koefisien polinomial
c = np.array([7,0,4,0,1])
print ("Coefficient list")
print (c)

# menghitung y = f(x)
y = polyval(x, c)

# print (x,y)
# kita bulatkan menjadi 4 angka di belakang koma
print ("Evaluating a polynomial")

# save ke dalam csv
# memberikan nama file
f = open("15_1.csv","w+")
```

```
for j in range(M):
     print (j,". x = ",round(x[j],4),"; y = ",round(y[j],4))
     f.write(str(j)+","+str(round(x[j],4))+","+str(round(y[j],4))+"\n")

# save file
f.close()

# mencari akar
r = polyroots(c)
print("The roots: ")
print(r)

# menggambar dan menyimpan plot
plt.figure(figsize = (16,9))
plt.plot(x,y,'o-')
plt.xlabel('x')
plt.ylabel('y')
plt.savefig('15_1.png',dpi = 250)
```

Berikut adalah gambar grafiknya:

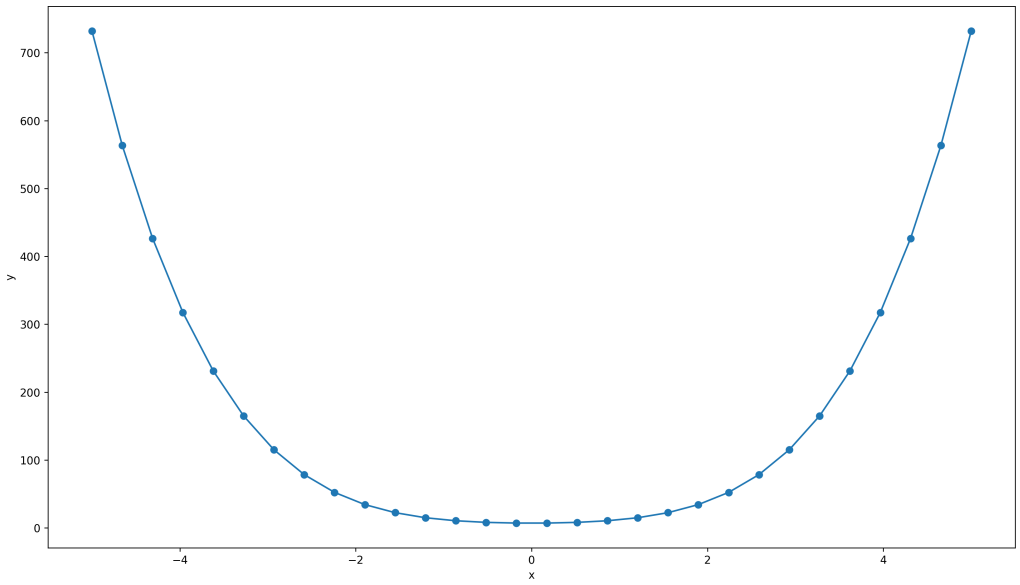

Figure 1: Gambar 15.1

Berikut adalah nilai x, y dari fungsi di atas:

```
##    X0   X.5.0   X732.0
## 1   1 -4.6552 563.2987
```

```
## 2   2 -4.3103 426.4982
## 3   3 -3.9655 317.1872
## 4   4 -3.6207 231.2938
## 5   5 -3.2759 165.0853
## 6   6 -2.9310 115.1685
## 7   7 -2.5862  78.4894
## 8   8 -2.2414  52.3335
## 9   9 -1.8966  34.3254
## 10 10 -1.5517  22.4291
## 11 11 -1.2069  14.9481
## 12 12 -0.8621  10.5249
## 13 13 -0.5172   8.1417
## 14 14 -0.1724   7.1198
## 15 15  0.1724   7.1198
## 16 16  0.5172   8.1417
## 17 17  0.8621  10.5249
## 18 18  1.2069  14.9481
## 19 19  1.5517  22.4291
## 20 20  1.8966  34.3254
## 21 21  2.2414  52.3335
## 22 22  2.5862  78.4894
## 23 23  2.9310 115.1685
## 24 24  3.2759 165.0853
## 25 25  3.6207 231.2938
## 26 26  3.9655 317.1872
## 27 27  4.3103 426.4982
## 28 28  4.6552 563.2987
## 29 29  5.0000 732.0000
```

Dari grafik dan data yang ada, terlihat bahwa $f(x)$ tidak memiliki akar *real*. Sehingga bisa diduga hasil perhitungan *roots* Python akan menghasilkan akar-akar bilangan kompleks.

Berikut adalah *roots* dari $y = f(x) = 0$.

```
The roots:
[-0.56822148-1.52409831j -0.56822148+1.52409831j  0.56822148-1.52409831j
  0.56822148+1.52409831j]
```

Dugaan kita terkonfirmasi.

TASK 2

Soal

15.2 Develop a Python program to evaluate the polynomial function $y = 3x^5 + 6$. Find an appropriate interval of x for which the function evaluation is done and plot the graph.

15.5 Develop a Python program to solve the polynomial function $y = 3x^5 + 6$.

Jawab

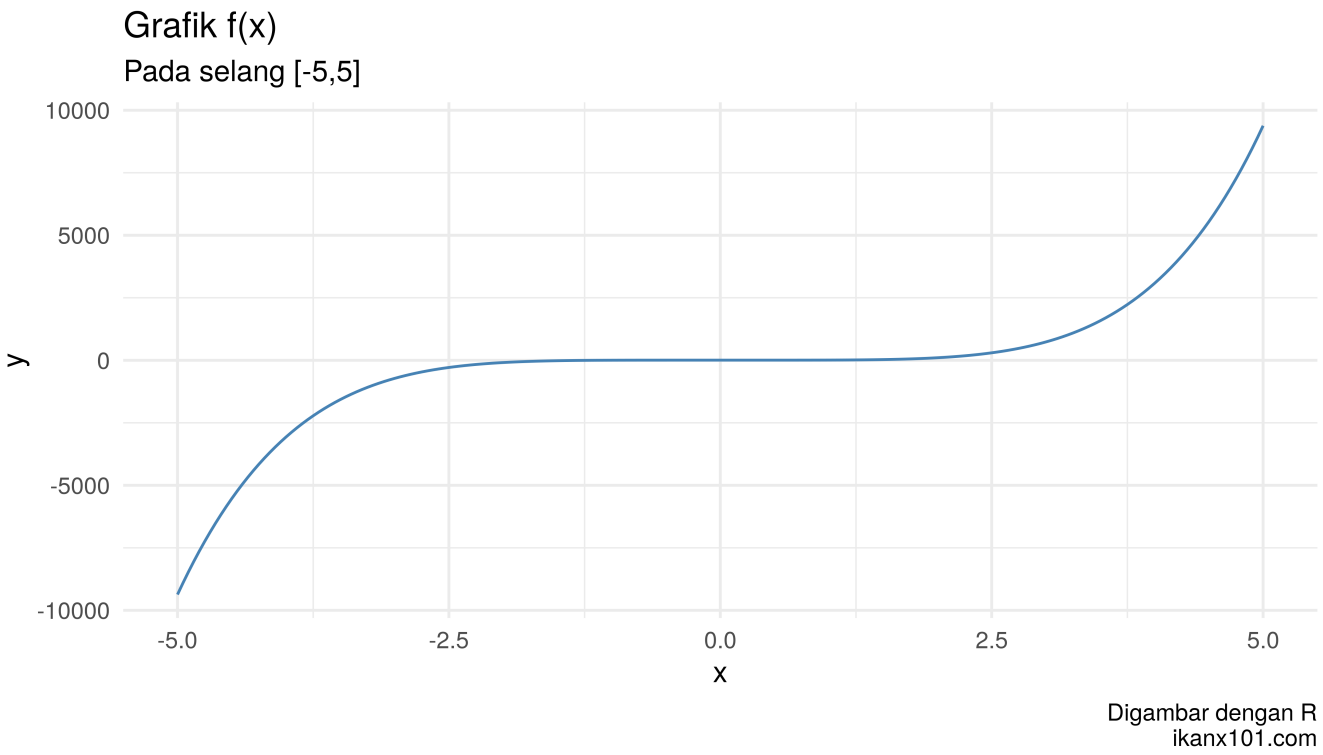

Figure 2: Gambar 15.2

TASK 3

Soal

15.3 Develop a Python program to evaluate the polynomial function $y = 2x^6 - 1.5x^5 + 5x^4 - 6.5x^3 + 6x^2 - 3x + 4.5$. Find an appropriate interval of x for which the function evaluation is done and plot the relevant data.

15.6 Develop a Python program to solve the polynomial function $y = 2x^6 - 1.5x^5 + 5x^4 - 6.5x^3 + 6x^2 - 3x + 4.5$.

Jawab

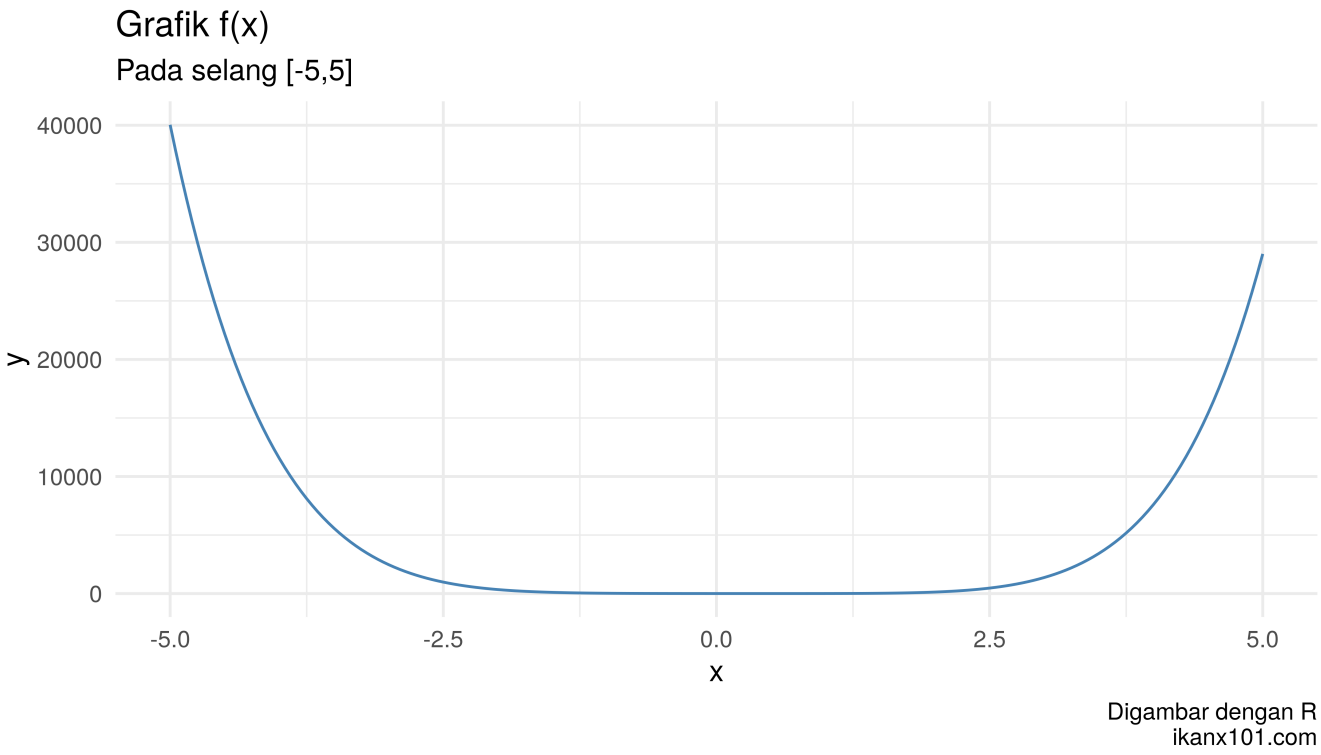

Figure 3: Gambar 15.3

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