MATH F111
Software-Based Assignment

Submitted to
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Question Number
14

Video Link
https://youtu.be/awAZT9kvG20

Table of Contents

Statement of the Problem

Find the direction of the position vector
$r = (\pi t - \sin\pi t) i + (1 - \cos\pi t) j$ at a given time "t" and sketch it.

One Application of the Problem

- To predict direction of velocity of an object at different time intervals

Variable Name

r0198x

r0198y

Screenshot of the code

```python
import math
import matplotlib.pyplot as plt


t = int(input("Value of t "))


# the coefficient of i will be the x term, and the coefficient of j will be y term
r0198x = math.pi * t - math.sin(math.pi * t)
r0198y = 1 - math.cos(math.pi * t)
m = math.sqrt(r0198x * r0198x + r0198y * r0198y)  # magnitude


# plotting the graph
if m != 0:  # only display plot when magnitude is not 0
    x = r0198x / m
    y = r0198y / m
    plt.arrow(0, 0, x, y, length_includes_head=True, width=0.01, head_length=0.1, head_width=0.05)


# graph styles
plt.title("Direction of position vector for t = {}".format(t))
plt.xlabel("X coordinate")
plt.ylabel("Y coordinate")
plt.style.use('presentation.mplstyle')
plt.axes().spines['bottom'].set_position(('data', 0))
plt.axes().spines['left'].set_position(('data', 0))
plt.show()
```

Output

```python
import math
import matplotlib.pyplot as plt

t = int(input("Value of t "))

# the coefficient of i will be the x term, and the coefficient of j will be y
r0198x = math.pi * t - math.sin(math.pi * t)
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m = math.sqrt(r0198x * r0198x + r0198y * r0198y)  # magnitude

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plt.show()
```
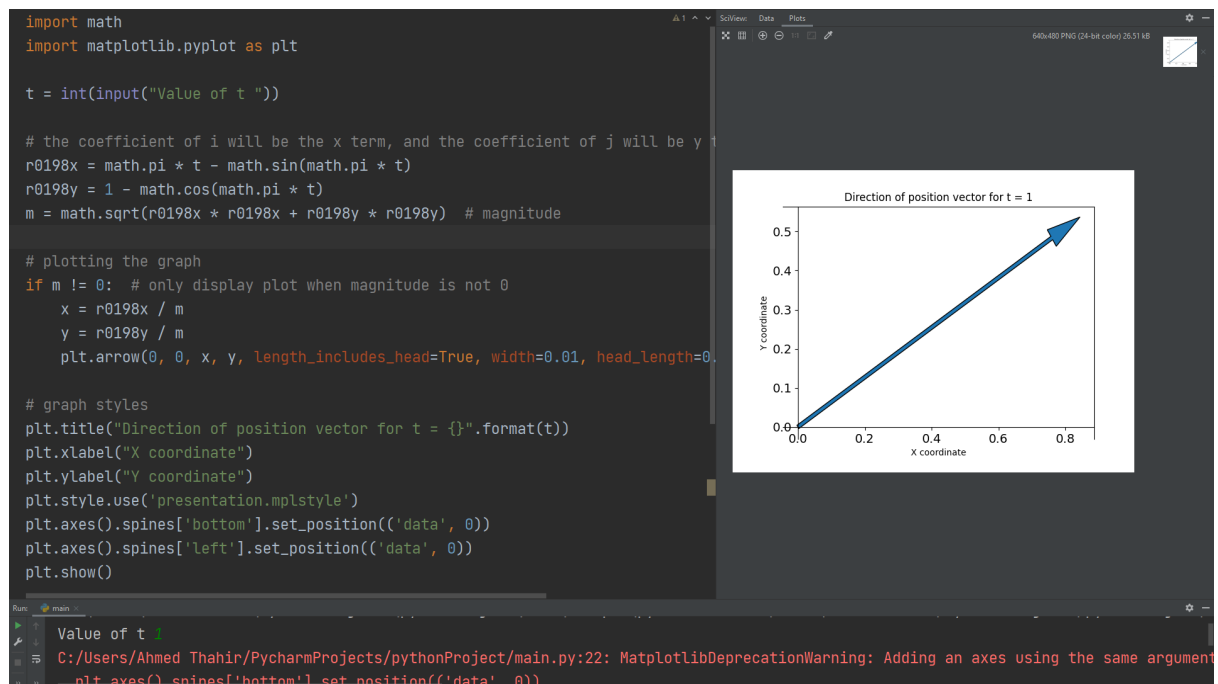
Value of t 1
C:/Users/Ahmed Thahir/PycharmProjects/pythonProject/main.py:22: MatplotlibDeprecationWarning: Adding an axes using the same argument
    plt.axes().spines['bottom'].set_position(('data', 0))

Figure outputs

Direction of position vector for t = 1

Direction of position vector for t = 2