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LAB 1: Intro to MATLAB & Self-Balancing Robot Setup

Introduction:

The objective of this lab is to install MATLAB, write code to compute matrix manipulations and graphically represent a function, then run the MATLAB script without any errors. To do so we had to read through tutorials to understand and apply the aforementioned concepts.

Question 1:

```
>> a = [1 0 0; 0 1 0; 0 0 1]

a =

     1     0     0
     0     1     0
     0     0     1

>> b = [1 0 0; 0 1 0; 0 0 1]

b =

     1     0     0
     0     1     0
     0     0     1

>> c = a + b

c =

     2     0     0
     0     2     0
     0     0     2

>> d = [1;2;3]

d =

     1
     2
     3

>> result = c * d

result =

     2
     4
     6
```

Question 2:

```
>> t = (0:0.4:10)

t =

  Columns 1 through 13

        0    0.4000    0.8000    1.2000    1.6000    2.0000    2.4000    2.8000    3.2000    3.6000    4.0000    4.4000    4.8000

  Columns 14 through 26

   5.2000    5.6000    6.0000    6.4000    6.8000    7.2000    7.6000    8.0000    8.4000    8.8000    9.2000    9.6000   10.0000

>> y = sin(t)

y =

  Columns 1 through 13

        0    0.3894    0.7174    0.9320    0.9996    0.9093    0.6755    0.3350   -0.0584   -0.4425   -0.7568   -0.9516   -0.9962

  Columns 14 through 26

  -0.8835   -0.6313   -0.2794    0.1165    0.4941    0.7937    0.9679    0.9894    0.8546    0.5849    0.2229   -0.1743   -0.5440

>> plot(t,y)
```
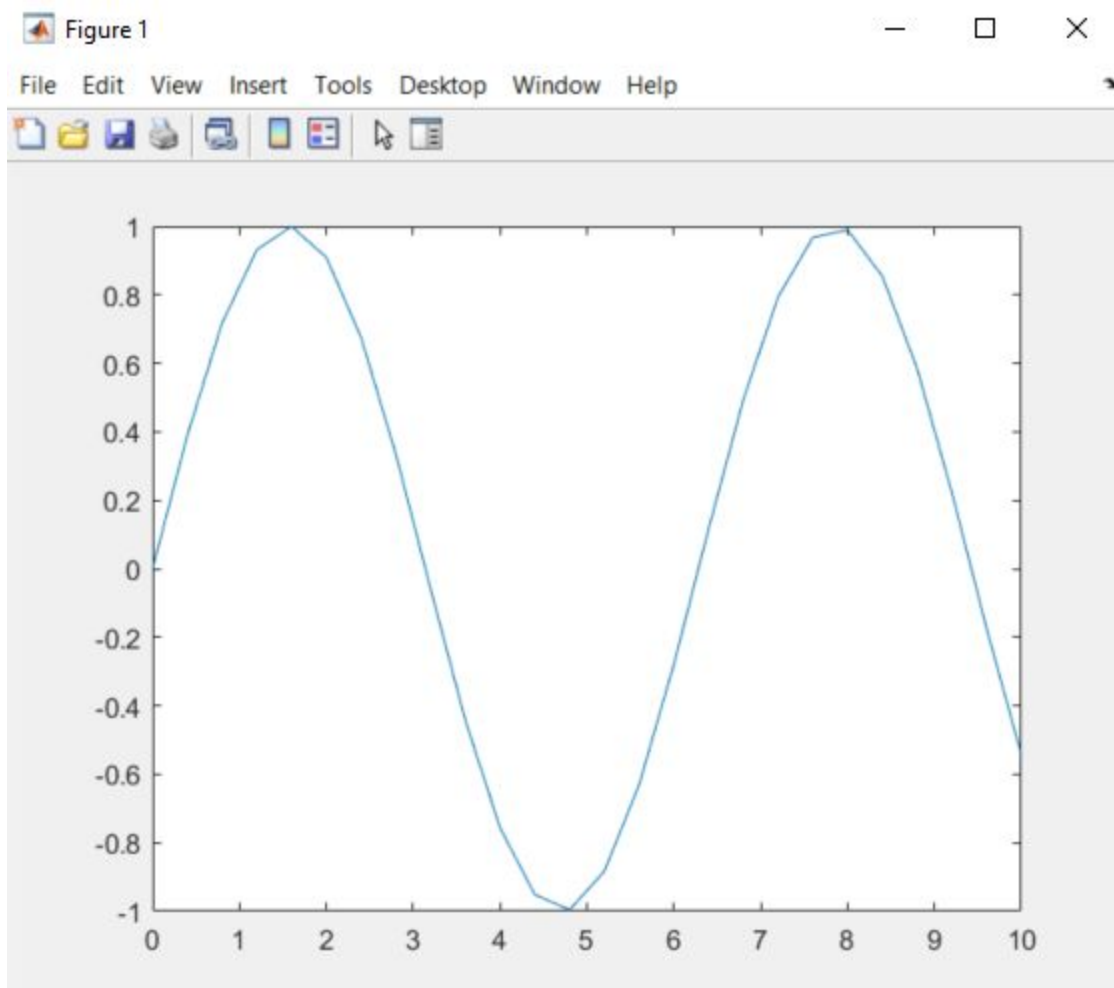
Question 3:

```
>> s = tf('s')

s =

  s

Continuous-time transfer function.

>> zero(s^4 + 3*s^3 - 15*s^2 - 2*s + 9)

ans =

   -5.5745
    2.5836
   -0.7951
    0.7860
```

Conclusion:

      Going into this lab Martin and I had no prior knowledge of MATLAB, but after completing this lab we now have a great understanding of rudimentary concepts such as programming matrices and plotting equations. This achieved our goals of performing basic linear algebra computations using the MATLAB command window, writing and running MATLAB script, using the plot function in MATLAB, and using the basic control system functions such as 'tf' and 'ss' in MATLAB. In summary, we learned matrix addition and multiplication techniques as well as plotting functions for MATLAB.