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Computational tools for engineers

EE5003

1. **Do exercise 3.5 on page 99 of the textbook.**

3.5 Write a script for the general solution to the quadratic equation $ax^2 + bx + c = 0$. Use the structure plan in Section 3.2.2. Your script should be able to handle all possible values of the data *a*, *b*, and *c*. Try it out on the following values:

(a) 1, 1, 1 (complex roots)

```
>> quad_solve_real_Musil(1,1,1)
complex roots
The roots are -0.500000+0.866025j and -0.500000+-0.866025j
```

(b) 2, 4, 2 (equal roots of −1.0)

```
>> quad_solve_real_Musil(2,4,2)
Equal roots of -1.00
```

(c) 2, 2, −12 (roots of 2.0 and −3.0)

```
>> quad_solve_complex_Musil(2,2,-12)
The roots are 2.00 and -3.00
```

2.

Create an m-file that plots the Bessel function of the first kind (one plot for order 1; one plot for order 2; one plot for order 3). Let z span from -20 to +20 in increments of 0.1. Make sure to create a title for each plot (enter: “help title” if you’ve forgotten how to do this). Note: The ‘figure’ command can be used to create a new figure window without losing existing figure windows.

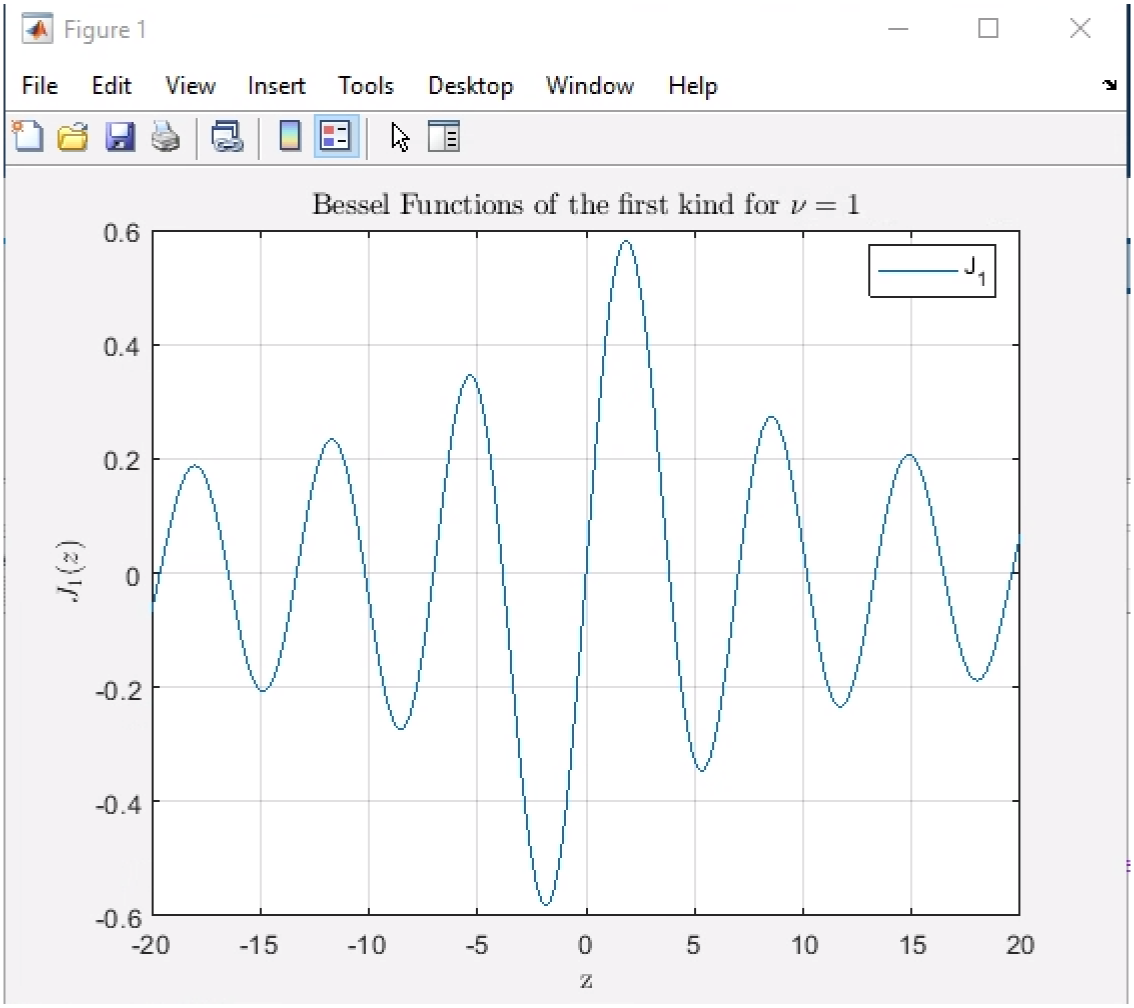
Figure 1
File Edit View Insert Tools Desktop Window Help
Bessel Functions of the first kind for $\nu = 1$
J_1
$J_1(z)$
z
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-20 -15 -10 -5 0 5 10 15 20

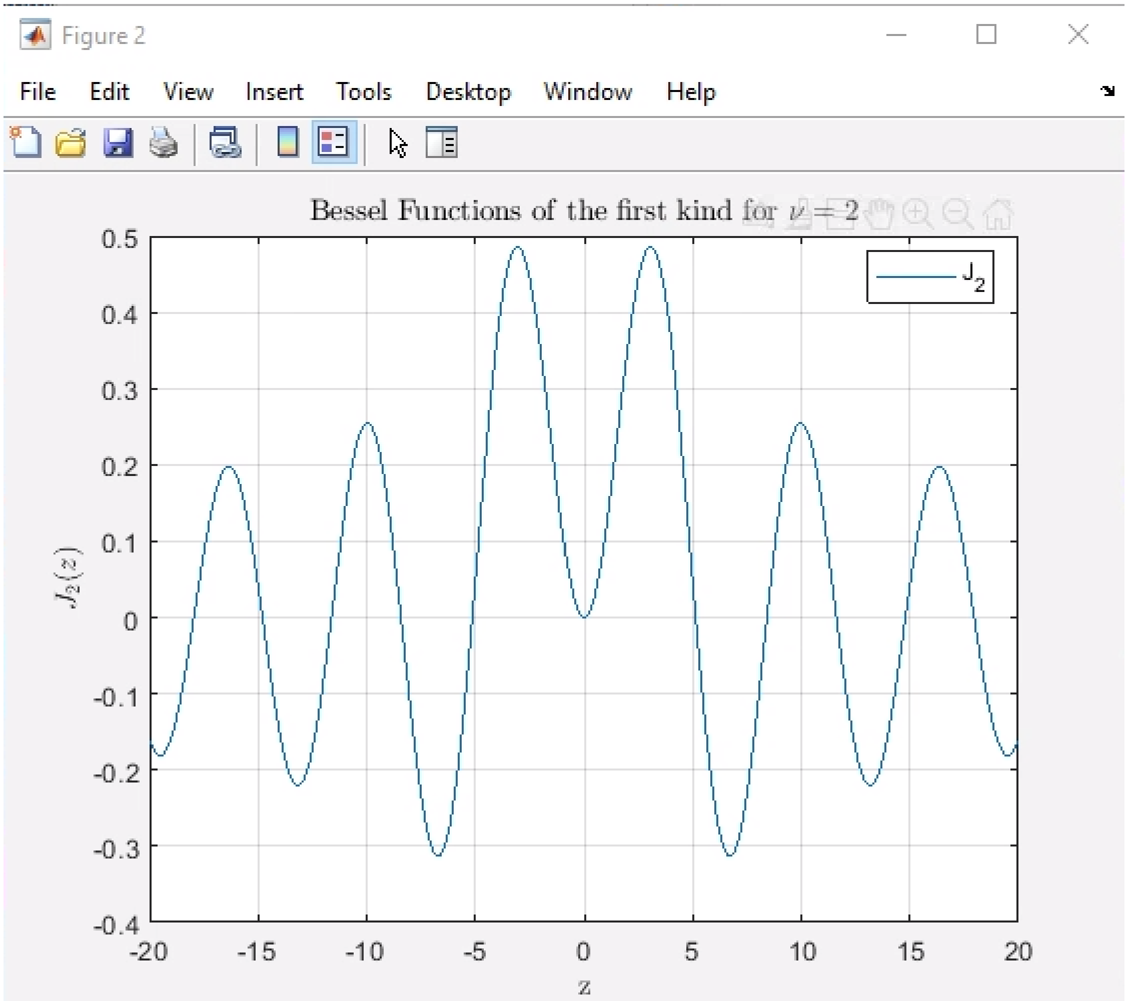
Figure 2
File Edit View Insert Tools Desktop Window Help
Bessel Functions of the first kind for $\nu = 2$
J_2
$J_2(z)$
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-20
-15
-10
-5
0
5
10
15
20
z

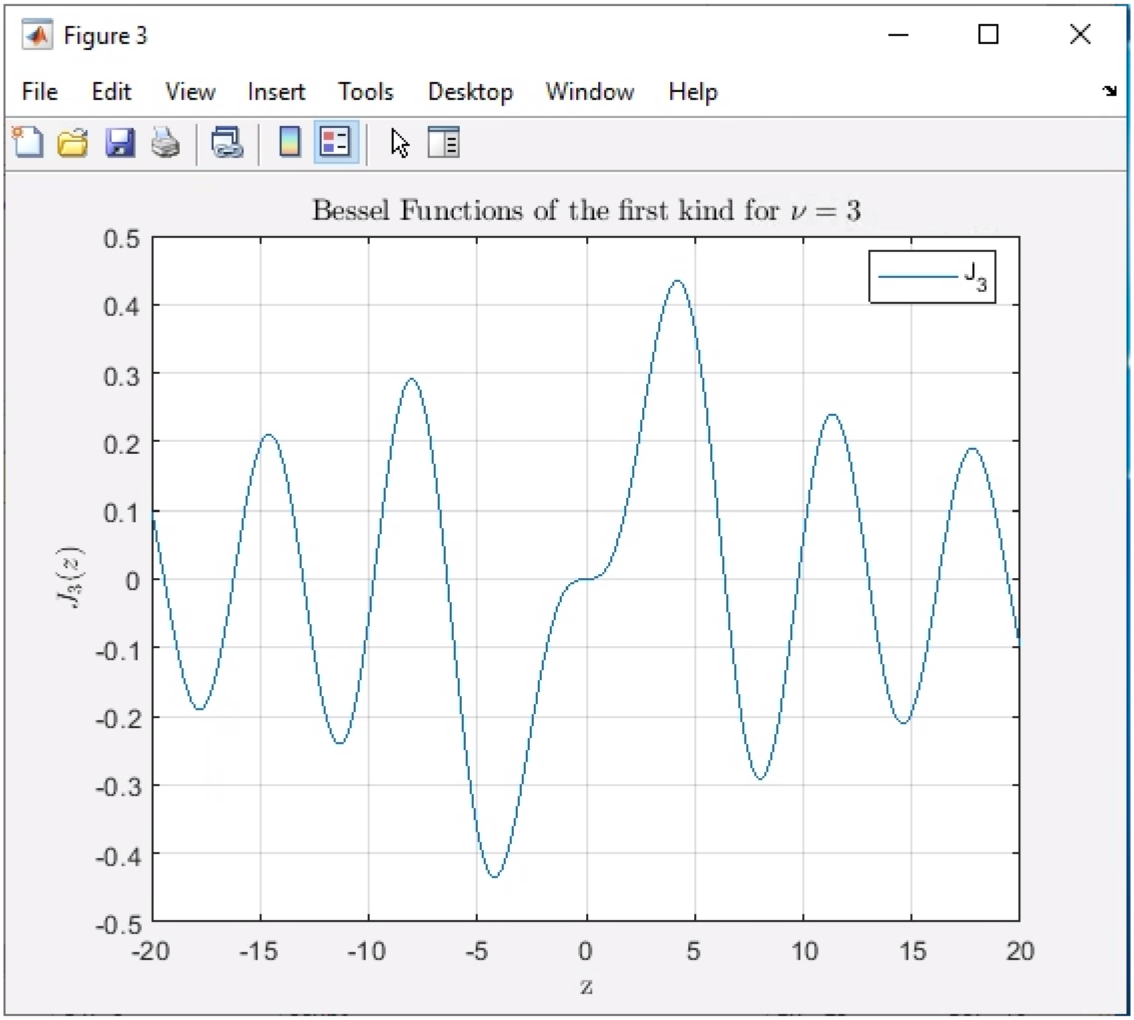
Figure 3
File Edit View Insert Tools Desktop Window Help
Bessel Functions of the first kind for $\nu = 3$
J_3
$J_3(z)$
z
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-20
-15
-10
-5
0
5
10
15
20

3.

Following the introduction provided by the screencast, create an m-file that loads in the ASCII battery data file and computes an estimate of the battery's internal resistance by averaging the values obtained from each measurement. Try to vectorize your code as much as possible.

```
>> battery_resistance_Musil

Rs =

    0.7441

Rs Estimate = 0.7441
fx >>
```