MATLAB Tutorial 05

ENME 303 Computational Methods for Engineers

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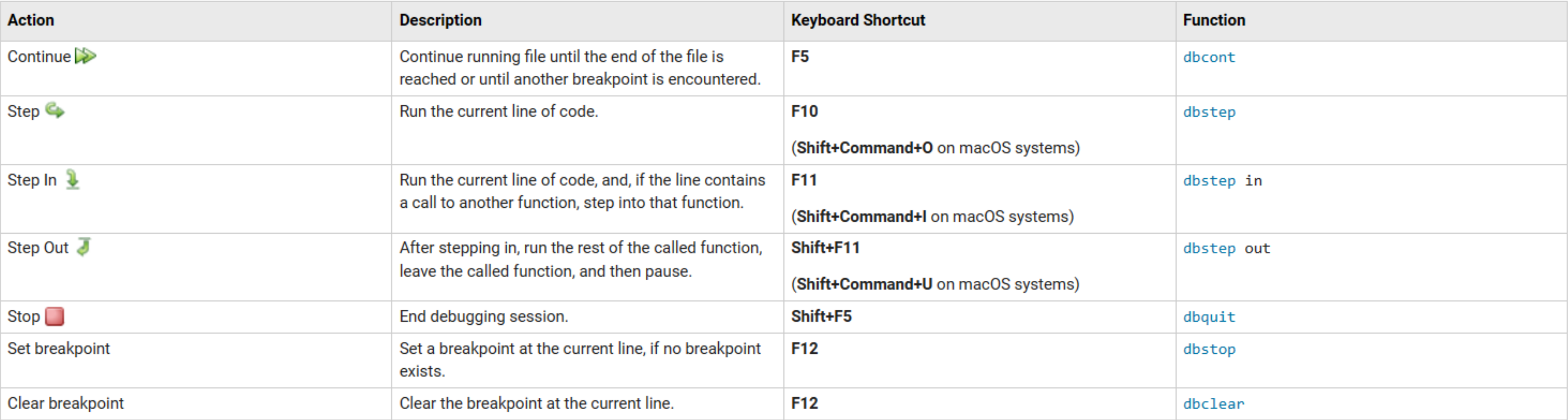
MATLAB Debugging Tools

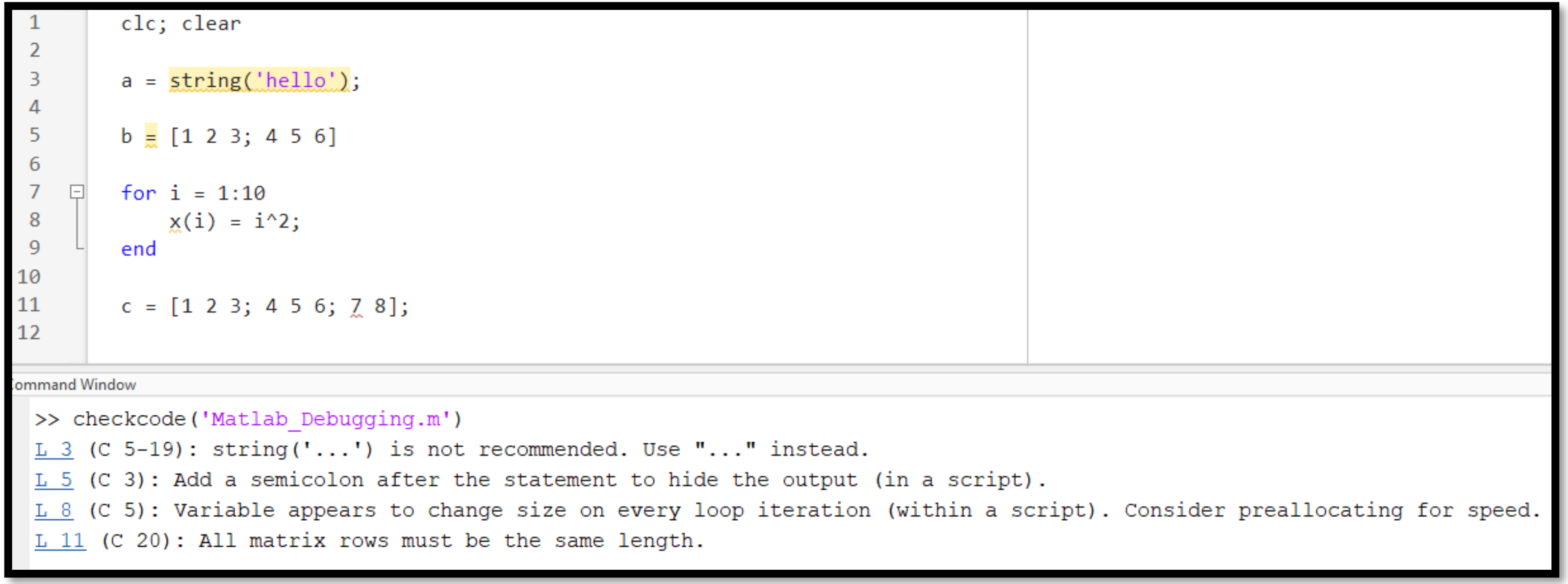


Action	Description	Keyboard Shortcut	Function
Continue	Continue running file until the end of the file is reached or until another breakpoint is encountered.	**F5**	`dbcont`
Step	Run the current line of code.	**F10** (**Shift+Command+O** on macOS systems)	`dbstep`
Step In	Run the current line of code, and, if the line contains a call to another function, step into that function.	**F11** (**Shift+Command+I** on macOS systems)	`dbstep in`
Step Out	After stepping in, run the rest of the called function, leave the called function, and then pause.	**Shift+F11** (**Shift+Command+U** on macOS systems)	`dbstep out`
Stop	End debugging session.	**Shift+F5**	`dbquit`
Set breakpoint	Set a breakpoint at the current line, if no breakpoint exists.	**F12**	`dbstop`
Clear breakpoint	Clear the breakpoint at the current line.	**F12**	`dbclear`

Useful Functions for Debugging Code

- checkcode(“file_name”)
- issues = codeIssues (“file_name”)
  - Since R2022b
- [status, results] = fix(issues, checkID)
  - Since R2023a

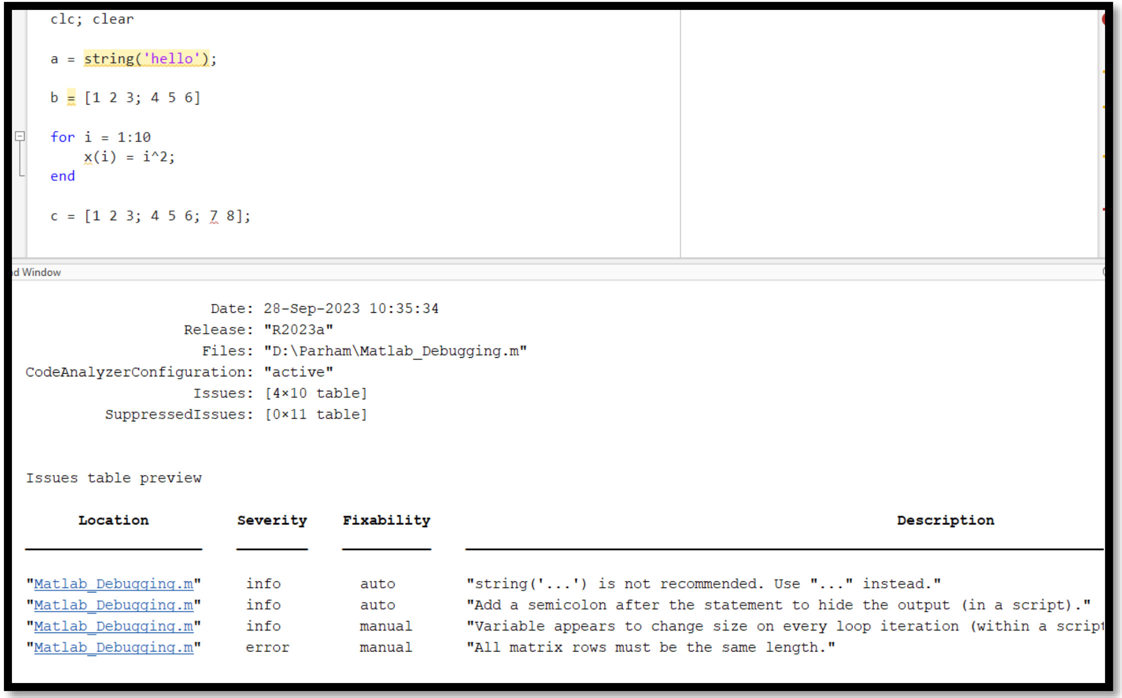
“checkcode” Function



```
1   clc; clear
2   
3   a = string('hello');
4   
5   b = [1 2 3; 4 5 6]
6   
7   for i = 1:10
8       x(i) = i^2;
9   end
10  
11  c = [1 2 3; 4 5 6; 7 8];
12  
```

```
>> checkcode('Matlab_Debugging.m')
L 3 (C 5-19): string('...') is not recommended. Use "..." instead.
L 5 (C 3): Add a semicolon after the statement to hide the output (in a script).
L 8 (C 5): Variable appears to change size on every loop iteration (within a script). Consider preallocating for speed.
L 11 (C 20): All matrix rows must be the same length.
```

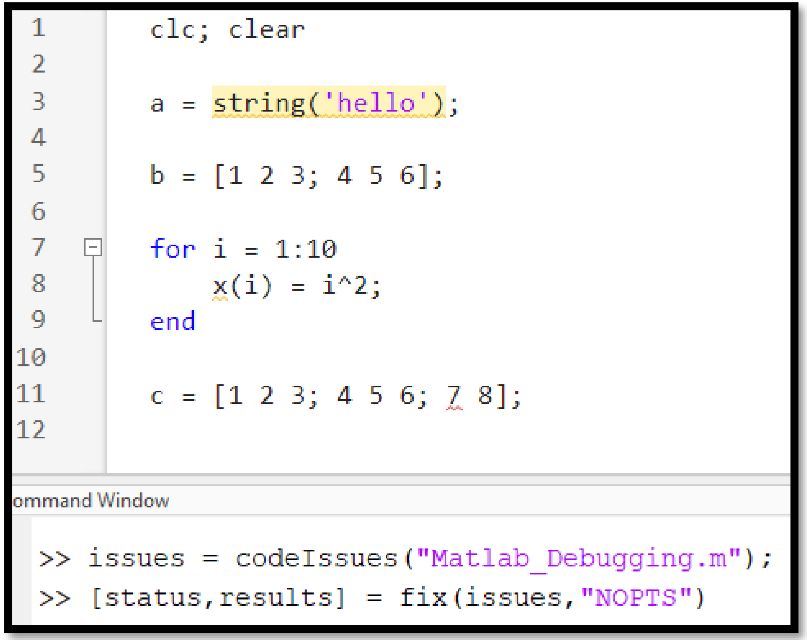
“codeIssues” Function



```
clc; clear

a = string('hello');

b = [1 2 3; 4 5 6]

for i = 1:10
    x(i) = i^2;
end

c = [1 2 3; 4 5 6; 7 8];
```

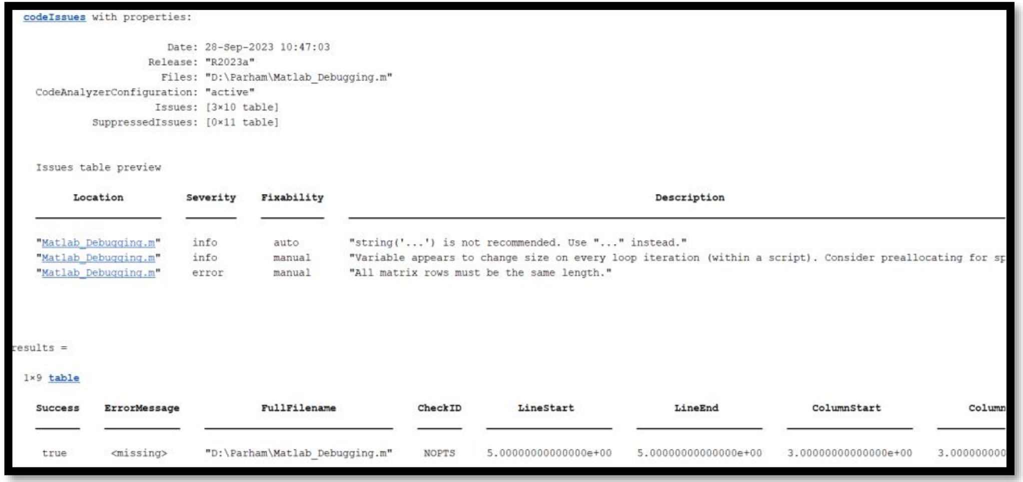
```
                     Date: 28-Sep-2023 10:35:34
                  Release: "R2023a"
                    Files: "D:\Parham\Matlab_Debugging.m"
CodeAnalyzerConfiguration: "active"
                   Issues: [4×10 table]
         SuppressedIssues: [0×11 table]


Issues table preview

      Location             Severity    Fixability                                  Description
____________________       ________    __________    ________________________________________________________________________

"Matlab_Debugging.m"         info        auto        "string('...') is not recommended. Use "..." instead."
"Matlab_Debugging.m"         info        auto        "Add a semicolon after the statement to hide the output (in a script)."
"Matlab_Debugging.m"         info        manual      "Variable appears to change size on every loop iteration (within a scrip
"Matlab_Debugging.m"         error       manual      "All matrix rows must be the same length."
```

“fix” Function



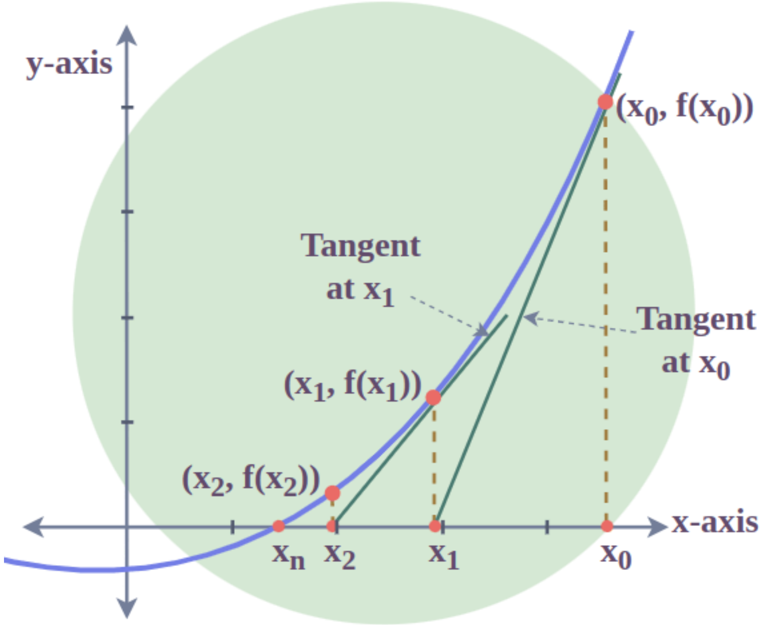
```
clc; clear

a = string('hello');

b = [1 2 3; 4 5 6];

for i = 1:10
    x(i) = i^2;
end

c = [1 2 3; 4 5 6; 7 8];
```

```
>> issues = codeIssues("Matlab_Debugging.m");
>> [status,results] = fix(issues,"NOPTS")
```



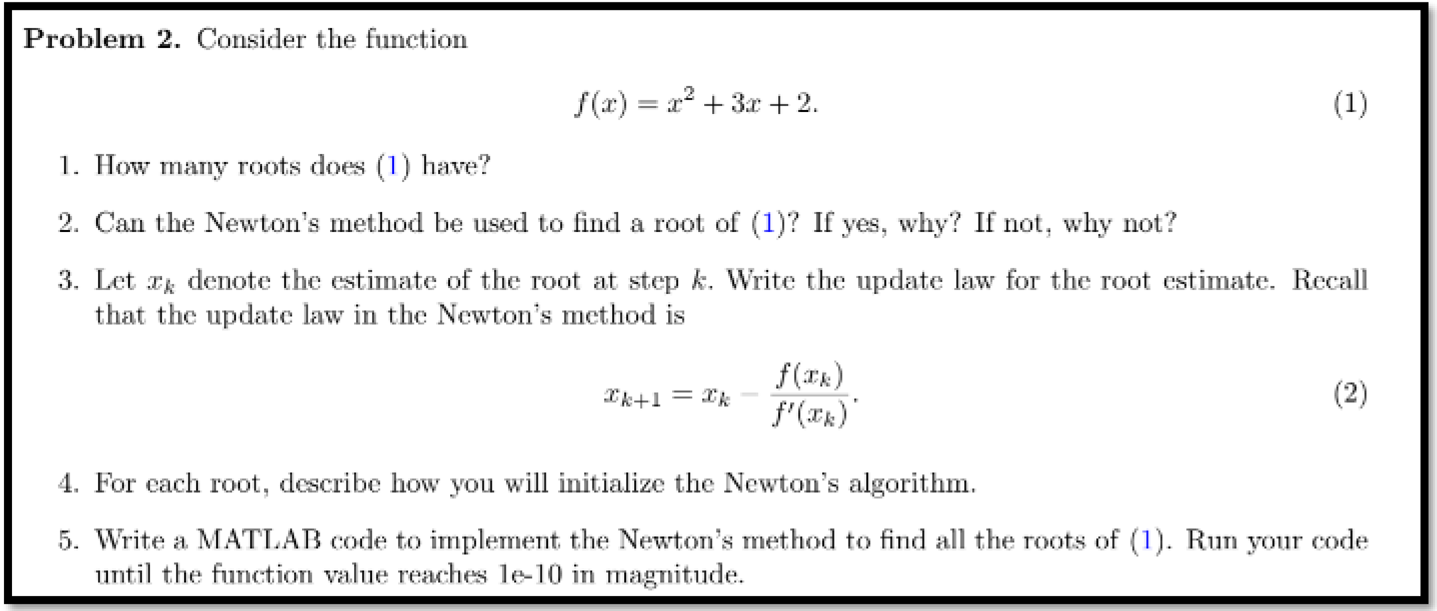
```
codeIssues with properties:

                    Date: 28-Sep-2023 10:47:03
                 Release: "R2023a"
                   Files: "D:\Parham\Matlab_Debugging.m"
 CodeAnalyzerConfiguration: "active"
                  Issues: [3×10 table]
          SuppressedIssues: [0×11 table]


 Issues table preview

       Location          Severity   Fixability                                  Description
 ____________________    ________   __________    ______________________________________________________________________________

 "Matlab_Debugging.m"     info        auto        "string('...') is not recommended. Use "..." instead."
 "Matlab_Debugging.m"     info        manual      "Variable appears to change size on every loop iteration (within a script). Consider preallocating for sp
 "Matlab_Debugging.m"     error       manual      "All matrix rows must be the same length."


esults =

  1×9 table

 Success    ErrorMessage            FullFilename            CheckID         LineStart               LineEnd              ColumnStart          Column
 _______    ____________    ______________________________   _______    ____________________   ____________________   ____________________   _______

  true       <missing>     "D:\Parham\Matlab_Debugging.m"    NOPTS     5.00000000000000e+00   5.00000000000000e+00   3.00000000000000e+00   3.000000000
```

Newton’s Method



$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Implementing Newton’s Method



Problem 2. Consider the function

$$f(x) = x^2 + 3x + 2. \tag{1}$$

1. How many roots does (1) have?
2. Can the Newton's method be used to find a root of (1)? If yes, why? If not, why not?
3. Let x_k denote the estimate of the root at step k. Write the update law for the root estimate. Recall that the update law in the Newton's method is

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}. \tag{2}$$

4. For each root, describe how you will initialize the Newton's algorithm.
5. Write a MATLAB code to implement the Newton's method to find all the roots of (1). Run your code until the function value reaches 1e-10 in magnitude.

Thanks!