
Lab3Simons.m

Table of Contents

Problem 1	1
Problem 2	2
Problem 3	2
Problem 4	3

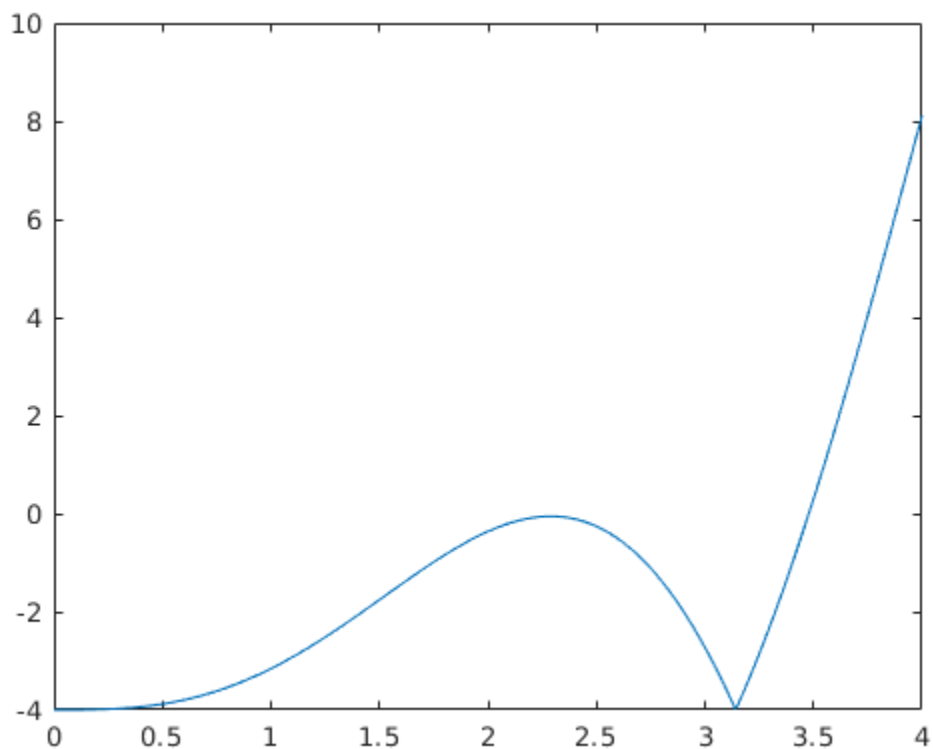
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Problem 1

```
% Use the Secant method to find the smallest positive zero of
%  $f(x) = x^2 |\sin x| - 4$  accurate to within  $10^{-6}$ .
problem1();

% There are at 2 values of  $x$  such that  $f(x) = 0$ .
% When we use  $p_0 = 3.6$  and  $p_1 = 3.7$ , the Secant method computes the
% zero on the interval  $(3, 4)$ . When we use  $p_0 = 2.8$  and  $p_1 = 2.9$ ,
% the Secant method computes the zero on the interval  $(2, 3)$ .

n:1 p1: 3.485730 |error|: 0.000001
n:1 p1: 2.576352 |error|: 0.000001
```



Problem 2

```
% Use Newton's method to approximate the zero of the function
% f(x) = x^2 - 2e^(-x)x + e^(-2x) accurate to within 10^(-8).
problem2();

% Newton's method converges relatively slowly. However, the modified
% Newton's method converges a bit faster than the original Newton's
% method.

% The modified Newton's method takes 22 iterations to approximate a
% solution for f(x). That is 5 fewer iterations than the original
% Newton's
% method.

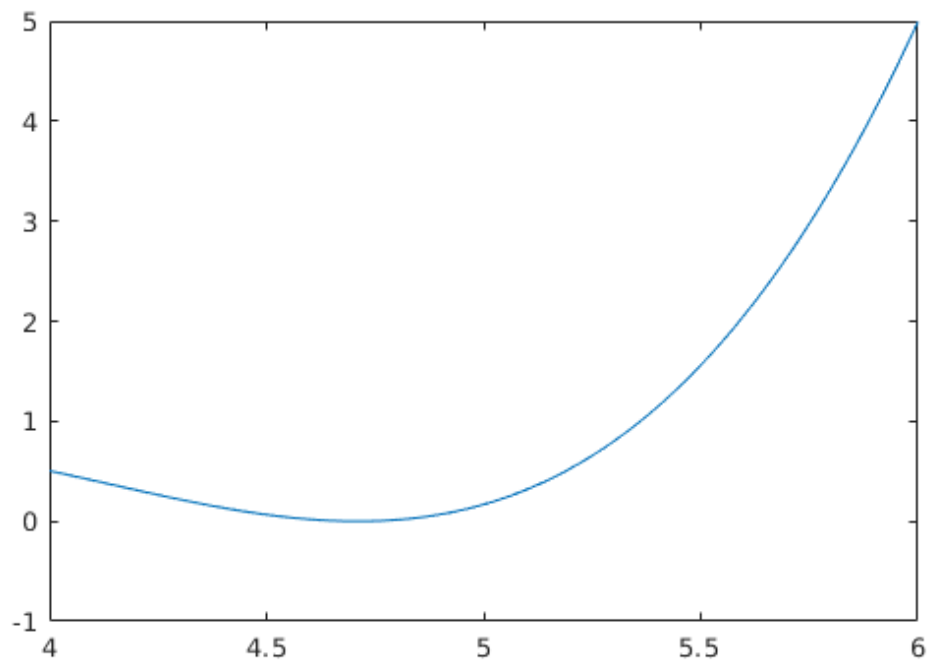
n:27 p27: 0.5671432949 |error|: 0.0000000001
n:22 p22: 0.5671432871 |error|: 0.0000000001
```

Problem 3

```
% % Use Newton's method to approximate the zeros of the function
% f(x) = x^3 -12.42x^2 + 50.444x - 66.552 for x # [4, 6] accurate to
% within 10^(-8).
problem3();

% When using Newton's method to approximate f(x), we usually get
% about 4.7
% for a couple of different initial guesses, and it almost always
% takes a
% very long time to converge. 4.72 is also a solution, but it is
% difficult to approximate to this value unless the initial guess is
% 4.72.
%
% The values of f'(x) at the zeroes are both about -22.

n:4106 p4106: 4.69996954 |error|: 0.00000001
n:1 p1: 4.72000000 |error|: 0.00000001
```



Problem 4

```
% Use fixed-point iteration and Steffenson's method to solve  $x = 5^{(-x)}$ .
problem4();

% Fixed-point iteration takes a much longer time than Steffenson's
% method
% to approximate a solution to  $x = 5^{(-x)}$ . Fixed-point iteration
% takes 59
% iterations, which is 40 more iterations than Steffenson's method.

n:59 p59: 0.46962192 |error|: 0.00000001
n:19 p19: 0.46962193 |error|: 0.00000001
```

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