Numerical Analysis HW5
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Ch7 - 1,3,5 (pg199)

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February 29, 2016

Problem 1. Employ fixed-point iteration to locate the root of

$$f(x) = \sin\left(\sqrt{x}\right) - x$$

Use an initial guess of $x_0 = 0.5$ and iterate until $\epsilon_a \leq 0.01\%$.
Verify that the process is linearly convergent as described at the end of Sec 6.1.

Problem 3. Determine the highest real root of

$$f(x) = x^3 - 6x^2 + 11x - 6.1$$

- Graphically
- Using the Newton-Raphson method (three iterations, $x_i = 3.5$)
- Using the secant method (three iterations, $x_{i-1} = 2.5$ and $x_i = 3.5$)
- Using the modified secant method (three iterations, $x_i = 3.5$, $\delta = 0.01$)
- Determine all the roots with MATLAB

Problem 9. Employ the Newton-Raphson method to determine a real root for

$$f(x) = -2 + 6x - 4x^2 + 0.5x^3$$

using an initial guess of 4.5 and 4.43. Discuss and use graphical and analytical methods to explain any peculiarities in your results.

Problem 1. Perform three iterations of the Newton-Raphson method to determine the root of Eq. (E7.1.1):

$$\frac{dz}{dt} = v_0 e^{-(c/m)t} - \frac{mg}{c}\left(1 - e^{-(c/m)t}\right)$$

Use the parameter values from Example 7.1 ($g = 9.81$ m/s^2, $z_0 = 100$ m, $v_0 = 55$ m/s, $m = 80$ kg, and $c = 15$ kg/s) along with an initial guess of $t = 3$ s.

Problem 3. Consider the following function:

$$f(x) = 3 + 6x + 5x^2 + 3x^3 + 4x^4$$

Locate the minimum by finding the root of the derivative of this function. Use bisection with initial guesses of $x_l = -2$ and $x_u = 1$.

Problem 5. Solve for the value of x that maximizes $f(x)$ in Prob. 7.4

$$f(x) = -1.5x^6 - 2x^4 + 12x$$

using the golden-section search. Employ initial guesses of $x_l = 0$ and $x_u = 2$ and perform three iterations.