Numerical Analysis Homework 1 Programming Report

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Problem B

(a) $x^{-1} - tanx$ on $[0, \frac{\pi}{2}]$: 0.860334
(b) $x^{-1} - 2^x$ on [0,1] : 0.641186
(c) $2^{-x} + e^x + 2cosx - 6$ on [1,3] : 1.82938
(d) $(x^3 + 4x^2 + 3x + 5)/(2x^3 - 9x^2 + 18x - 2)$ on [0,4] : 0.117877

Problem C

Root near 4.5 : 4.49341
Root near 7.7 : 7.72525

Problem D

(a) $sin(x/2) - 1$ with $x_0 = 0, x_1 = \frac{\pi}{2}$: 3.14159
(b) $e^x - tanx$ with $x_0 = 1, x_1 = 1.4$: 1.30633
(c) $x^3 - 12x^2 + 3x + 1$ with $x_0 = 0, x_1 = -0.5$: -0.188685

Problem E

Using the bisection method, Newton's method, and the secant method, the depth of water in the trough obtained is 0.84 ft

Problem F

(a) D = 55 in., $\alpha = 32.4823$
(b) D = 30 in., $\alpha = 32.4823$
(c) When the initial value is 33°, for both D = 55 in. and D = 30 in., the α obtained is 32.4823. When the initial values are too far away from 33°, which are set to be 0° and 100° in this case, $\alpha = 46.9018$ when D = 55 in. , and $\alpha = -42.9159$ when D = 30 in. When the initial values are too far away from the root, there is a large possibility that the value obtained from the algorithm is another root of the function, and not the root we desire. In the second case, where the α obtained is -42.9159, this value is a root of the function, but this doesn't exist in the real world, as the depth of the water has to be positive.