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CS 3010 Assignment 3

1. $f(x) = x^3 + 3x - 1$ $[0, 1]$

a=0 b=1 c=0.5 f(c)= 0.625

a=0 b=0.5 c=0.25 f(c)= -0.234375

a=0.25 b=0.5 c=0.375 f(c)= 0.177734375

a=0.25 b=0.375 c=0.3125 f(c)= -0.031982421875

a=0.3125 b=0.375 c=0.34375 f(c)= 0.071468895

a=0.3125 b=0.34375 c=0.328125 f(c)= 0.019702911

a=0.3125 b=0.328125 c=0.3203125 f(c)= -0.006191406

a=0.3203125 b=0.328125 c=0.32421875 f(c)= 0.006737411

a=0.3203125 b=0.32421875 c=0.32226562 f(c)= 0.000265814364

$f(x) = x^3 - 2\sin x$ $[0.5, 2]$

a=0.5 b=2 c=1.25 f(c)= 0.055155761 3

a=0.5 b=1.25 c=0.875 f(c)= -0.865186512 5

a=0.875 b=1.25 c=1.0625 f(c)= -0.547686 9 7 7

a=1.0025 b=1.25 c=1.15625 f(c)= -0.284791400 8

a=1.15625 b=1.25 c=1.20312 5 f(c)= -0.124 7 9 8 6 15 5

a=1.203125 b=1.25 c=1.226562 5 f(c)= -0.077 3 9 8 6 6 5

a=1.226562 5 b=1.25 c=1.238281 25 f(c)= 0.00 8 25 8 0 1 5 4

a=1.226562 5 b=1.238281 25 f(c)= -0.014 7 10 2 16 2

a=1.232421 875 b=1.238281 25 f(c)= -0.003 2 6 6 0 1 4 2

a=1.235351563 b=1.238281 25 f(c)= 0.00 2 4 8 6 0 11 9

a=1.235351563 b=1.236816406 f(c)= 0.000 3 9 2 4 7 0 6 8

$h(x) = x + 10 - x(\cos h(\frac{50}{x}))$ $[120, 130]$

$a = 120$ $b = 130$ $f(c) = -0.134046447$

$a = 125$ $b = 130$ $f(c) = 0.069789606$

$a = 125$ $b = 127.5$ $f(c) = -0.031080614$

$a = 126.25$ $b = 127.5$ $f(c) = 0.019612387$

$a = 126.25$ $b = 126.875$ $f(c) = -0.005669150$

$a = 126.5625$ $b = 126.875$ $f(c) = 0.006987105$

$a = 126.5625$ $b = 126.71875$ $f(c) = 0.000663388$

$f(x) = x^3 + 2x^2 + 10x - 20$ $x_0 = 2$

$f'(x) = 3x^2 + 4x + 10$

$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 1.406666667$

$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 1.371512014$ $f(x_2) = 0.0570866$

$x_3 = 1.368410223$ $f(x_3) = 0.000044661443$

$x_4 = 1.368405104$ $f(x_4) = 2.4 \cdot 10^{-11}$

$f(x) = x^3 + 2x^2 + 10x - 20$ $x_0 = 2$ $x_1 = 1$

$x_0 = 2$ $x_1 = 1$ $m = \frac{f(x_0) - f(x_1)}{x_0 - x_1} = 23$

$x_1 = 1$ $x_2 = 1.304347826$ $m = 18.614$

$x_3 = 1.37605561$ $m = 1.37605561$

Results:

f(x) = x^3 + 3x - 1, on [0,1]
0.32218537 9 true
0.32218537 24 true
0.32218537 4 true
0.32218537 8 true

f(x) = x^3 + 2x^2 + 10x - 20, starting with x_0 = 2 and x_1 = 1.
1.3688082 9 true
1.3688082 23 true
1.3688082 4 true
1.3688082 12 true

3x^3 + 5x^2 - 7
0.94518006 9 true
0.94518006 23 true
0.94518006 5 true
0.94517994 10000 false