BLG202E – MIDTERM

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Question 4. a:

Newton > Secant > Bisection

(from foskest to slowest)

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Question 4.6 : $f(x) = x^2 - 2x - 3$

x	0	1	2	3	4	5
f(x)	-3	-4	-3	0	5	12

1st Iteration

$f(2) = -3 < 0$, $f(3) = 0$ (root exist between 2 and 3)

$x_0 = \frac{2+3}{2} = 2,5$ $[2,5 , 5]$

$f(x_0) = f(2,5) = (2,5)^2 - 2(2,5) - 3 = -1,75$

$-1,75 < 0$.

2nd Iteration

$f(2,5) = -1,75 < 0$, $f(3) = 0$ (root exist between 2,5 and 3)

$x_1 = \frac{2,5 + 3}{2} = 2,75$ $[2,5 , 3]$

$f(x_1) = f(2,75) = (2,75)^2 - 2(2,75) - 3 = -0,9375$

$-0,9375 < 0$

3rd Iteration

$f(2,75) = -0,9375 < 0$ and $f(3) = 0$ (root exist between 2,75 and 3)

$x_2 = \frac{2,75 + 3}{2} = 2,875$

Relative Error $= \left| \frac{2.875 - 3}{3} \right| = 0,04166667$

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Question 4.c : $f(x) = x^2 - 2x - 3$

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

$f(x_n) = x^2 - 2x - 3$ $\quad n = 0 \Rightarrow x_0 = 7$

$f'(x_n) = 2x - 2$

1st iteration

$$x_1 = 7 - \frac{32}{12} = 7 - 2,666667 \cong 4,333333$$

2nd Iteration

$$x_2 \cong 4,333333 - \frac{7,108889}{6,666666} \cong 4,333333 - 1,066334$$

$$\cong 3,266999$$

3rd Iteration

$$x_3 \cong 3,266999 - \frac{1,1373}{4,5331} \cong 3,27 - \frac{1,1373}{4,5331} \cong 3,27 - 0,2508$$

$$= 3,0192$$

$$\text{Relative Error} = \left| \frac{3,0192 - 3}{3} \right| = 0,0064$$

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Question 4.e:

$e_N = 0,0064$

$e_b = 0,04166667$ $\quad e_b > e_N$