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Assignment #7

Ques #1.

$f(x) = x^2 + 3x - 7.$

$f'(x) = 2x + 3.$

We know, $x_{k+1} = x_k - \dfrac{f(x_k)}{f'(x_k)}$

For $\boxed{x_0 = 1}$

$f(x_0) = 1^2 + 3.1 - 7 = -3$

$f'(x_0) = 2 \times 1 + 3 = 2 + 3 = 5.$

$x_1 = x_0 - \dfrac{f(x_0)}{f'(x_0)} = 1 - \dfrac{-3}{5} = 1.6.$

For, $\boxed{x_1 = 1.6}$

$f(x_1) = (1.6)^2 + 3 \times 1.6 - 7 = 0.36$

$f'(x_1) = 2 \times (1.6) + 3 = 6.2.$

$x_2 = x_1 - \dfrac{f(x_1)}{f'(x_1)} = 1.6 - \dfrac{0.36}{6.2} = 1.54193.$

For, $\boxed{x_2 = 1.54193}$

$f(x_2) = (1.54193)^2 + 3 * (1.54193) - 7 = 3.33812 \times 10^{-3}.$

$f'(x_2) = 2 * 1.54193 + 3 = 6.08386.$

$x_3 = x_2 - \dfrac{f(x_2)}{f'(x_2)} = 1.54193 - \dfrac{3.33812 \times 10^{-3}}{6.08386} = 1.54138.$

For $\boxed{x_3 = 1.54138}$

$f(x_3) = (1.54138)^2 + 3 \times 1.54138 - 7 = -7.6956 \times 10^{-6}$

$f'(x_3) = 2 * 1.54138 + 3 = 6.08276.$

$x_4 = x_3 - \dfrac{f(x_3)}{f'(x_3)} = 1.54138 - \dfrac{-76956 \times 10^{-6}}{6.08276} = 1.54138.$

For $\boxed{x_4 = 1.54138}$

$f(x_4) = -7.6956 \times 10^{-6}.$

$f'(x_4) = 6.08276.$

$x_5 = 1.54138.$

K	x_k	$f(x_k)$	$f'(x_k)$
O	1	-3	5
1	1.6	0.36	6.2
2	1.54193	3.33812×10^{-3}	6.08386
3	1.54138	-7.6956×10^{-6}	6.08276
4	1.54138	-7.6956×10^{-6}	6.08276.

$\boxed{\text{The root} = 1.54138.}$

(Ans)

$f(x) = x^3 + 3x^2 + 5x + 7.$

We know for secant method,.

$$x_{k+1} = x_k - \frac{f(x_k)(x_k - x_{k-1})}{f(x_k) - f(x_{k-1})}.$$

$x_0 = 0 ; f(0) = 7.$

$x_1 = 1 ; f(-1) = 4.$

For $x_1 = x_0 - \frac{f(x_0).(x_0 - x_{-1})}{f(x_0) - f(x_{-1})} = 0 - \frac{7(0+1)}{7-4} = -2.33333.$

[For x_2]

$f(x_1) = f(-2.33333) = f - 1.03701$

$x_2 = x_1 - \frac{f(x_1)(x_1 - x_0)}{f(x_1) - f(x_0)} = -2.33333 - \frac{-1.03701 \times (-2.33333 - 0)}{(-1.03701 - 7)} = -2.03226$

[For x_3]

$f(x_2) = f(-2.03226) = 0.83554.$

$x_3 = x_2 - \frac{f(x_2)(x_2 - x_1)}{f(x_2) - f(x_1)} = -2.03226 - \frac{(0.83554)(-2.03226 + 2.33333)}{0.83554 + 1.03701} = -2.16650$

[For x_4]

$f(x_3) = f(-2.16660) = 0.07911.$

$x_4 = x_3 - \frac{f(x_3)(x_3 - x_2)}{f(x_3) - f(x_2)} = -2.16660 - \frac{0.07911(-2.16660 + 2.03226)}{0.07911 - 0.83554}.$

$$= -2.18065.$$

The root $= -2.18065$ (Ans)

Ques #3

Secant method is better than newton method in finding the root.

1. Secant method requires 1 evaluation per iteration whereas ~~Aetw~~ newton method requires 2.

2. ~~Sean~~ Secant method is faster than newton method.