# Assignment 2: Newton's Method & Secant Method

Tuesday, October 17, 2023 4:59 PM

## Newton's Method

$f(x) = x^3 + 2x^2 + 10x - 20$ $\quad x_0 = 2 \quad \varepsilon = 0.00001$

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

$f(2) = 16 \neq 0$

1. $x_1 = 2 - \frac{16}{30} = 1.46666667$

2. $x_2 = 1.46666667 - \frac{2.123851852}{22.32} = 1.371512014$

3. $x_3 = 1.371512014 - \frac{0.057086664 18}{21.12918367} = 1.368810223$

4. $x_4 = 1.368810223 - \frac{0.000044611438}{21.09616517} = 1.368808108$

5. $f(x_4) = 0.000000000000028 < 0.00001$

## Secant Method

$f(x) = x^3 + 2x^2 + 10x - 20$ $\quad x_0 = 2 \quad x_1 = 1 \quad \varepsilon = 0.00001$

$x_2 = 1 - \frac{(1-2)f(2)}{f(1) - f(2)} = x_2 = 1.304347826087$

$f(x_2) = -1.334757945178$

$x_3 = 1.304347826087 - \frac{(1.304347826087 - 1) f(x_2)}{f(1) - f(x_2)} = x_3 = 1.376053620394$

$f(x_3) = 0.153173294824$

$x_4 = 1.376053620394 - \frac{(1.376053620394 - 1.304347826087) f(x_3)}{f(x_2) - f(x_3)} = x_4 = 1.368671965353$

$f(x_4) = 0.002872216$

$x_5 = 1.368671965353 - \frac{(1.368671965353 - 1.376053620394) f(x_4)}{f(x_3) - f(x_4)} = 1.368807822253$

$f(x_5) = 0.000000601254$