HW 3-1(a) Newton Raphson

$f(x) = 4x^4 - 3x^3 - 30$

$f'(x) = 16x^3 - 9x^2$

$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$, $e_s = 0.5\%$

i	x_i	$f(x_i)$	$f'(x_i)$	x_{i+1}	e_a (%)
1	−2	58	−164	−1.64634	21.48148
2	−1.64634	12.77287	−95.79092	−1.51300	8.81303
3	−1.51300	1.35174	−76.01876	−1.49522	1.18923
4	−1.49522	0.02152	−73.60637	−1.49493	0.01956

$i = 1$

$f(-2) = 4(-2)^4 - 3(-2)^3 - 30 = 58$

$f'(-2) = 16(-2)^3 - 9(-2)^2 = -164$

$x_2 = -2 - \frac{58}{(-164)} = -1.64634$

$e_a = \left| \frac{-1.64634 - (-2)}{-1.64634} \right| \times 100\% = 21.48148\%$

$i = 2$

$f(-1.64634) = 4(-1.64634)^4 - 3(-1.64634)^3 - 30 = 12.77287$

$f'(-1.64634) = 16(-1.64634)^3 - 9(-1.64634)^2 = -95.79092$

$x_3 = -1.64634 - \frac{12.77287}{(-95.79092)} = -1.51300$

$e_a = \left| \frac{-1.51300 - (-1.64634)}{-1.51300} \right| \times 100\% = 8.81303\%$

HW3-1 (b) Secant

$f(x) = 4x^4 - 3x^3 - 30$, $es = 0.5\%$ $x_{i+1} = x_i - \dfrac{f(x_i)(x_{i-1} - x_i)}{f(x_{i-1}) - f(x_i)}$

i	x_{i-1}	x_i	x_{i+1}	$f(x_{i-1})$	$f(x_i)$	e_a (%)
1	1.5	2	1.832636	-19.875	10	9.13242
2	2	1.832636	1.874591	10	-3.345467	2.238095
3	1.832636	1.874591	1.879762	-3.345467	-3.367090	0.275090

$i = 1$

$f(1.5) = 4(1.5)^4 - 3(1.5)^3 - 30 = -19.875$

$f(2) = 4(2)^4 - 3(2)^3 - 30 = 10$

$x_2 = 2 - \dfrac{10(1.5-2)}{(-19.875 - 10)} = 1.832636$

$e_a = \left| \dfrac{1.832636 - 2}{1.832636} \right| \times 100\% = 9.13242\%$

$i = 2$

$f(1.832636) = 4(1.832636)^4 - 3(1.832636)^3 - 30 = -3.345467$

$x_3 = 1.832636 - \dfrac{(-3.345467)(2 - 1.832636)}{(10 - (-3.345467))} = 1.874591$

$e_a = \left| \dfrac{1.874591 - 1.832636}{1.874591} \right| \times 100\% = 2.238095\%$