HW2-(a) Bisection

$f(x) = x^3 + 12x^2 - 100x - 6$

$m = \frac{a+b}{2}$, $e_s = 0.5\%$

a	f(a)	b	f(b)	m	e_a(%)	f(m)
5	−81	6	42	5.5	NA	−26.625
5.5	−26.625	6	42	5.75	4.348	5.85938
5.5	−26.625	5.75	5.85938	5.625	2.222	−10.83398
5.625	−10.83398	5.75	5.85938	5.6875	1.099	−2.60083
5.6875	−2.60083	5.75	5.85938	5.71875	0.5465	1.60080
5.6875	−2.60083	5.71875	1.60080	5.70313	0.2738	

1st row

$a = 5$

$f(a) = 5^3 + (12)(5^2) - (100)(5) - 6 = -81$

$b = 6$

$f(b) = 6^3 + (12)(6^2) - (100)(6) - 6 = 42$

$m = \frac{a+b}{2} = \frac{5+6}{2} = 5.5$

$f(m) = 5.5^3 + (12)(5.5^2) - (100)(5.5) - 6 = -26.625$

2nd row

$m = \frac{(5.5+6)}{2} = 5.75$ | $e_a = \left|\frac{5.75-5.5}{5.75}\right| \times 100 = 4.348\%$

$f(m) = (5.75)^3 + (12)(5.75)^2 - (100)(5.75) - 6 = 5.85938$

3rd row

$m = \frac{(5.5+5.75)}{2} = 5.625$ | $e_a = \left|\frac{5.625-5.75}{5.625}\right| \times 100\% = 2.222\%$

$f(m) = (5.625)^3 + (12)(5.625)^2 - (100)(5.625) - 6 = -10.83398$

HW2-1(b) False position

$f(x) = x^3 + 12x^2 - 100x - 6$

$x_r = x_u - \dfrac{f(x_u)(x_l - x_u)}{f(x_l) - f(x_u)}$, $e_s = 0.5\%$

x_l	$f(x_l)$	x_u	$f(x_u)$	x_r	$e_a(\%)$	$f(x_r)$
5	−81	6	42	5.65854	NA	−6.44433
5.65854	−6.44433	6	42	5.70396	0.79635	−0.39484
5.70396	−0.39484	6	42	5.70672	0.04831	

1st row

$x_l = 5$

$f(x_l) = (5)^3 + (12)(5)^2 - (100)(5) - 6 = -81$

$x_u = 6$

$f(x_u) = (6)^3 + (12)(6)^2 - (100)(6) - 6 = 42$

$x_r = 6 - \dfrac{(42)(5-6)}{(-81-42)} = 5.65854$

$f(x_r) = (5.65854)^3 + (12)(5.65854)^2 - (100)(5.65854) - 6 = -6.44433$

2nd row

$x_r = 6 - \dfrac{(42)(5.65854-6)}{(-6.44433-42)} = 5.70396$

$e_a = \left|\dfrac{5.70396 - 5.65854}{5.70396}\right| \times 100\% = 0.79635\%$

$f(x_r) = (5.70396)^3 + (12)(5.70396)^2 - (100)(5.70396) - 6 = -0.39484$