Answer on Question #46678 – Math – Algorithms | Quantitative Methods

Using synthetic division and perform two iterations of the Birge-Vieta method to find the smallest positive root of the equation $x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$. Use the initial approximation $\mathrm{p}_0 = 0.5$.

Solution:

In the given task according to the condition, we have the initial approximation $\mathrm{p}_0 = 0.5$. So we apply the synthetic division to our equation based on the above information.

0.5	1	-3	3	-3	2
		0.5	-1.25	0.875	-1.0625
	1	-2.5	1.75	-2.125	0.9375 = b_4
		0.5	-1	0.375	
	1	-2	0.75	-1.750 = c_3	

Then the value of $\mathrm{p}_1 = \mathrm{p}_0 - \frac{b_4}{c_3} = 0.5 - \frac{0.9375}{-1.750} = 1.0356$

Now we substitute the find value of $\mathrm{p}_1$equal to 1.0356.

1.0356	1	-3	3	-3	2
		1.0356	-2.0343	1.0001	-2.0711
	1	-1.9644	0.9657	-1.9999	-0.0711 = b_4
		1.0356	-0.9619	0.0039	
	1	-0.9288	0.0038	-1.9960 = c_3	

Then we can calculate the value of $\mathrm{p}_2 = \mathrm{p}_1 - \frac{b_4}{c_3} = 1.0356 - \frac{-0.0711}{-1.9960} = 0.99997875$

Finally we found the smallest positive root of the equation which is equal to 1.0