
Problem Set 2 SOLUTIONS

Question 1: If $g(x) = x^2 - 3$ has a root in [1,3]. Use the bisection method to approximate the root that is accurate to at least within 10^{-2}.

SOLUTION

Step1: we make sure that g(1)*g(3) < 0 by finding both g(1) & g(3)

g(1) = $1^2 - 3$ = -2 < 0

g(3) = $3^2 - 3$ = 9 – 3 = 6 > 0

Therefore, g(1)*g(3) = -12 < 0

Step2: we create the following table:

n	an	bn	pn	g(pn)
0	1	3	2	1
1	1	2	1.5	-0.75
2	1.5	2	1.75	0.0625
3	1.5	1.75	1.625	-0.359375
4	1.625	1.75	1.6875	-0.152343
5	1.6875	1.75	1.71875	-0.045898

Question 2: If $g(x) = x^2 - 3$ has a root in [1,3]. How many iterations are needed for the bisection to get an error of less than 10^{-2}.

SOLUTION

$|E| \leq \left|\frac{b-a}{2^n}\right| <$ tolerance

$\left|\frac{b-a}{2^n}\right| <$ tolerance

$\left|\frac{3-1}{2^n}\right| < 10^{-2}$

$\left|\frac{2}{2^n}\right| < \frac{1}{10^2}$

$\left|\frac{1}{2^n}\right| < \frac{1}{2*10^2}$

$2^n > 2 * 10^2$

$\ln(2^n) > \ln(2 * 10^2)$

$n*\ln(2) > \ln(2 * 10^2)$

$n > \frac{\ln(2*10^2)}{\ln(2)} \approx 7.643$

The number of iterations is 8 iterations.

GOOD LUCK!

STUDY + LEARN + SOLVE QUIZ 2 = PASS QUIZ 2

Best Regards

Mohammed K.A Kaabar

Website: http://www.mohammed-kaabar.net