Bisection Method

- To find roots of a polynomial, transcendental equation.

Algorithm.

For any continuous function $f(x)$

Step 1. for two points, say a and b, such that $a < b$ and $f(a) * f(b) < 0$

Step 2 find midpoint $c = \frac{a+b}{2}$

Step 3 If c is the root of $f(x)$, i.e., $f(c) = 0$

else, $f(c) * f(b) < 0$, let $a = c$

else if $f(c) * f(a) < 0$, let $b = c$

Step 4. Repeat step 2, step 3 until $f(c) = 0$.

Problem. Determine the root of the given equation

$x^2 - 3 = 0$

Solution.

$x^2 - 3 = 0$, let $f(x) = x^2 - 3$

Let $a = 1$, $b = 2$

$f(1) = 1 - 3 = -2 < 0$

$f(2) = 4 - 3 = 1 > 0$

$\therefore$ root lies between 1 & 2.

$\therefore c = \frac{1+2}{2} = 1.5$

$f(c) = 2.25 - 3 = -0.75 < 0$

$\therefore$ root lies between 1.5 and 2