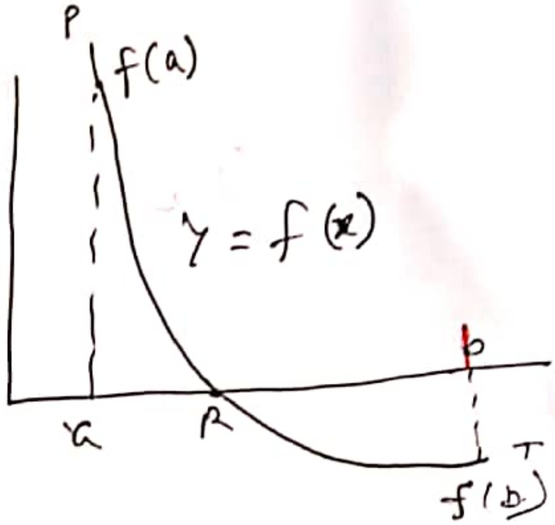
Zero function

Root finding Method

1) Bisection Method
2) Method of false position
3) Newton Raphson's Method
4) Fixed point iteration method

* Bisection method: If a function $f(x)$ is continuous between a and b, and $f(a) \cdot f(b) < 0$ (or $f(a)$ and $f(b)$ are of opposite sign) then there exists at least one root between a and b.



midpoint, $x_0 = \frac{a+b}{2}$

1) $f(x_0) = 0$ or
2) $f(x_0) \neq 0$

* Find a real root of the equation $x^3-2x^2-4=0$

$$f(x) = x^3 - 2x^2 - 4$$

will be given in q ← $\boxed{\begin{array}{l} a = 2 \\ b = 3 \end{array}}$ $\rightarrow f(a) = -4$, $\rightarrow f(b) = 5$

$f(a)f(b) < 0$

$$x_0 = \frac{a+b}{2} = \frac{2+3}{2} = 2.5$$

* $f(x_0) = -0.875$ neg

$f(b) = 5$ pos

x_0 ও b এর মধ্যে root আছে

* $x_1 = \dfrac{x_0+b}{2} = \dfrac{2.5+3}{2} = 2.75$

$f(x_1) = 1.671875$

* $x_2 = \dfrac{x_1+x_0}{2} = 2.625$

$f(x_2) = 0.306640625$

* $x_3 = \dfrac{x_2+x_0}{2} = 2.5625$

$f(x_3) = -0.306396484$

* $x_4 = \dfrac{x_3+x_2}{2} = 2.59375$ $f(x_4) = -0.0055236821$

* $x_5 = \dfrac{x_4+x_2}{2} = 2.609375$ $f(x_5) = 0.149135589$

* $x_6 = \dfrac{x_5+x_4}{2} = 2.6015625$ $f(x_6) = 0.071451664$

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* $x_7 = \frac{x_6 + x_4}{2} = 2.59765625$

$\therefore f(x_7) = 0.0328755597$

$x_8 = \frac{x_7 + x_4}{2} = 2.595703125$

$f(x_8) = 0.01315388$

$x_9 = \frac{x_8 + x_4}{2} = 2.594726563$

$f(x_9) = 0.004055583$

$x_{10} = \frac{x_9 + x_4}{2} = 2.594238281$. $f(x_{10}) = -0.000730427$

Hence an approximate root is 2.594.

H.W

1) $x^3 + x^2 - 1 = 0$ $(a = 0, b = 1)$

2) $\sin x = 1 - x^2$