BISECTION METHOD:

This method is a root-finding method that applies to any continuous functions with two known values of opposite signs.

FORMULA:

$x_m = \frac{x_l + x_u}{2}$

ADVANTAGES:

1. Always convergent.
2. The roots get halved with each iteration.

DISADVANTAGES:

1.Slow convergence.

2.if one of the initial guesses is close to the root, the convergence is slower.

3. If a function f(x)is such that it just touches the x-axis it will be unable to find the lower and upper guesses.

4.Function changes sign but roots do not exist.

EXAMPLE:

cosx-xe^x=0

F(0) =cos(0)-0e^0=0

F(2) =cos (2)-2e^2=0

So, the roots are (0,2).

x_l=0

x_u=2

Now,

$x_m = \frac{0+2}{2}$=1

Now,

New roots are

x_m=$\frac{1+2}{2}$=1.5

New roots are (1.5,2)

x_m=$\frac{1.5+2}{2}$=1.7

Error:

$|E_a|$=$\left|\frac{x_{new}-x_{old}}{x_{new}}\right|$

= $\left|\frac{1.7-1.5}{1.7}\right| \times 100$

=11%