

Practice Problems

Question # 1

Use bisection method to find the real root of $f(x) = \sqrt{x} - \cos x$ over $[0,1]$ with absolute approximate error < 0.01

Ans: $x = 0.64844$

Question # 2

Use method of false position to find the real root of $f(x)$ in Question#1 with same interval and absolute approximate error.

Ans: $x = 0.64356$

Question # 3

Solve $x = 2e^{-x}$ by bisection and Regula-Falsi method over $[0,1]$ with percentage relative approximate true error $< 1\%$ and comments on the result.

Ans: $x = 0.85156$ (bisection)

Ans: $x = 0.85396$ (regula-falsi method)

Question # 4

A data base file memory is related to time i.e,

$$N(t) = t^3 - 7t^2 + 14t + 10$$

Where $N(t)$ represent number of bytes and t represents time. Find the time at which file memory reach 16 bytes by using False Position method? Where $a = 0, b = 1$ and absolute true error < 0.001

Ans: $t = 0.58653$

Question # 5

Resistance of moving vehicle , $f(x) = x^4 - x - 10$ where x is the displacement. Find the displacement at zero resistance by using fixed point iteration method with absolute approximate error < 0.0001 and $x_0 = 4$

Ans: $x = 1.85558$

Question # 6

A shell is fired vertically upward and its vertical height x in meters is given by,

$$x = \cos t - 3t + 3$$

Where t represent time in seconds. Determine the time required for the vertical height will reach 2m by using fixed point iteration method with initial guess=0 and absolute approximate error<0.00001

Ans: $t = 0.60710$

Question # 7

The number of clients in the ABC server is related to time i.e,

$$N(t) = 75e^{-1.5t} + 20e^{-0.075t}$$

Determine the time required for the server will have 15 clients by using Newton-Raphson Method with an initial guess of $t = 6$ and stopping criteria of Absolute approximate percentage error<0.5%

Ans: $t = 4.00163$

Question # 8

A particle is moving with the velocity $v(t) = t \cos(t) + \sin(t)$ at time t . Find the time at which particle will be at rest by using secant method with an initial guesses $t_0 = 2$ and $t_1 = 3$ and stopping criteria of absolute approximate error<0.00001

Ans: $t = 0.02876$

Question # 9

Find the root of $f(x) = x^{\frac{1}{2}} + x^{-\frac{1}{2}} - 3$ by using Newton-Raphson method with absolute approximate error<0.0001 and $x_0 = 2$

Ans: $x = 6.85410$

Question # 10

The displacement s cm of the end of a stiff spring at time t seconds is given by

$$s = a + kf + \sin t + t - 3.5$$

Determine the time at which displacement of the spring is 4.5 cm, if $a = 2$, $k = 0.9$ and $f = 5$. Use Fixed point iteration method with absolute approximate error < 0.01 where $t_0 = 2$

Ans: $t = 0.786767$

Question # 11

The pressure p of the atmosphere at height h above ground level is given by

$p = c(h - p_0)^2 + \ln(h) - 2$, where p_0 is the pressure at ground level and $c = 1$ (*constant*). Determine the height at pressure $p = 2$ by using Newton-Raphson Method with absolute approximate error < 0.0001 (take $h_0 = 1.5$)

$$h = 1.41239$$