RV College of Engineering®
Mysore Road, RV Vidyaniketan Post,
Bengaluru - 560059, Karnataka, India

Department of Mathematics

VECTOR CALCULUS, LAPLACE TRANSFORM & NUMERICAL METHODS (MA221TA)

UNIT-V

Numerical Methods

TUTORIAL SHEET-1

1. If f(x) is a continuous function such that f(a).f(b) < 0, then the equation f(x) = 0, has _____ roots in the interval [a, b].

2. In the method of false position for finding the root of an equation f(x) = 0, in the interval [a, b] the curve f(x) is replaced by _____.

3. In Newton-Raphson method for finding the root of an equation f(x) = 0, in the interval [a, b] the curve f(x) is replaced by _____.

4. If f(x) is a continuous function such that f(a) and f(b) have same sign, then the equation f(x) = 0, has _____ roots in the interval [a, b].

5. Find the positive real root of the equation $x^4 - x - 10 = 0$, which lies between 1 and 2 by method of false position correct to five places of decimal.
(Answer: 1.855584)

6. Find an approximate real root of the equation $= \frac{\cos(x)+1}{3}$, correct to four places of decimal using Regula falsi method. (Answer: 0.6071)

7. Find a positive real root of the equation $2x - \ln(x) = 6$, correct to three places of decimal by method of chords.
(Answer: 3.257)

8. Using method of false position find a positive real root of the equation $x\sin(x) + \cos(x) = 0$ which lies between 2 and 3 correct three places of decimal.
(Answer: 2.798)

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Numerical Methods

TUTORIAL SHEET-2

1. Find the negative real root of equation $x^3 - 21x + 3500 = 0$, correct to four places of decimal using Newton-Raphson method. (Answer: -15.64385)

2. Find a positive real root of equation $xsin(x) + \cos(x) = 0$ near $x = \pi$ using method of tangents. (Answer: 2.798)

3. Using Newton-Raphson method find the reciprocal of a non-zero positive number 'N', hence find (1/31).

4. The bacteria concentration in a reservoir varies as $c = 4e^{-2t} + e^{-0.1t}$, using Newton Raphson method , calculate the time required for bacteria concentration to be 0.5 (Answer: 6.889)

5. The current 'I' in an electric circuit is given by $I = 10e^{-t}\sin(2\pi t)$, 't' in seconds, using Newton Raphson method find the value of 't' for I = 2A. (Answer: 0.0333)

6. Determine the root of the equation $x^2 - \ln(x) - 12 = 0$, in (3, 4) using Newton's method. (Answer: 3.646044)

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Numerical Methods

TUTORIAL SHEET-3

1. Obtain the Taylor series solution of the initial value problem $y' = y\sin(x) + \cos(x)$, y(0) = 0, up to terms containing x^5. Hence, find y(0.1)
(Answer: $y = x + \frac{x^3}{6} + \frac{x^5}{120} + \cdots$, y(0.1) = 0.10016675)

2. Find the approximate Taylor series solution of $xy' = x - y, y(2) = 2$ for x = 2.1
(Answer: 2.00238)

3. Using the Runge-Kutta method evaluate y(1.1), given $y' = 2x - y, y(1) = 3, h = 0.1$
(Answer: 2.9145)

4. Solve $y' - x^2y = x, y(0) = 1$ for x = 0.1, 0.2 by using Runge-Kurta method.
(Answer: 1.0053, 1.0227)

5. By using Milne method solve $y' = x^2 + y^2, y(0) = 1$ finding y(0.1), y(0.2) and y(0.3) from the Taylor series method. (Answer: 1.6876)

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