NUMERICAL METHOD ASSIGNMENT

1. If one root of the equation $f(x)=0$ is near to x_0 then the first approximation of this root as calculated by Newton-Raphson method is the abscissa of the point where the following straight line intersects the *x*-axis

(a) Normal to the curve $y=f(x)$ at the point $(x_0, f(x_0))$

(b) Tangent to the curve $y=f(x)$ at the point $(x_0, f(x_0))$

(c) The straight line through the point $(x_0, f(x_0))$ having the gradient $\frac{1}{f'(x_0)}$

(d) The ordinate through the point $(x_0, f(x_0))$

2. A root of the equation $x^3-3x-5=0$ lies between 2 and 2.5. Its value as obtained by using Newton-Raphson method, is

(a) 2.25 (b) 2.33 (c) 2.35 (d) 2.45

3. After second iteration of Newton-Raphson method, the positive root of equation $x^2=3$ is (taking initial approximation $\frac{3}{2}$)

(a) $\frac{3}{2}$ (b) $\frac{7}{4}$ (c) $\frac{97}{56}$ (d) $\frac{347}{200}$

4. If one root of the equation $x^3+x^2-1=0$ is near to 1.0, then by Newton-Raphson method the first calculated approximate value of this root is

(a) 0.9 (b) 0.6 (c) 1.2 (d) 0.8

5. The approximate value of a root of the equation $x^3-3x-5=0$ at the end of the second iteration by taking the initial value of the roots as 2, and by using Newton-Raphson method, is

(a) 2.2806 (b) 2.2701 (c) 2.3333 (d) None of these

6. Newton-Raphson method is used to calculate $\sqrt[3]{65}$ by solving $x^3=65$. If $x_0=4$ is taken as initial approximation then the first approximation x_1 is

(a) 65/16 (b) 131/32 (c) 191/48 (d) 193/48

7. Starting with $x_0=1$, the next approximation x_1 to $2^{1/3}$ obtained by Newton's method is

(a) $\frac{5}{3}$ (b) $\frac{4}{3}$ (c) $\frac{5}{4}$ (d) $\frac{5}{6}$

8. The approximate value of $\int_1^9 x^2 dx$ by using Trapezoidal rule with 4 equal intervals is

(a) 243 (b) 248 (c) 242.8 (d) 242.5

9. Taking *n* = 4, by trapezoidal rule, the value of $\int_0^2 \frac{dx}{1+x}$ is

(a) 1.1125 (b) 1.1176 (c) 1.118 (d) None of these

10. With the help of trapezoidal rule for numerical integration and the following table

x :	0	0.25	0.50	0.75	1
f(*x*) :	0	0.0625	0.2500	0.5625	1

The value of $\int_0^1 f(x)\,dx$ is

(a) 0.35342 (b) 0.34375 (c) 0.34457 (d) 0.33334

11. If for *n* = 3, the integral $\int_1^{10} x^3 dx$ is approximately evaluated by Trapezoidal rule $\int_1^{10} x^3 dx = 3\left[\frac{1+10^3}{2}+\alpha+7^3\right]$, then $\alpha=$

(a) 3^3 (b) 4^3 (c) 5^3 (d) 6^3

12. By trapezoidal rule, the value of $\int_1^2 \frac{1}{x}dx$, (using five ordinates) is nearly

(a) 0.216 (b) 0.697 (c) 0.921 (d) None of these

13. By the application of Simpson's one-third rule for numerical integration, with two subintervals, the value of $\int_0^1 \frac{dx}{1+x}$ is

(a) $\frac{17}{24}$ (b) $\frac{17}{36}$ (c) $\frac{25}{35}$ (d) $\frac{17}{25}$

14. By Simpson's rule, the value of $\int_{-3}^{3} x^4 dx$ by taking 6 sub-intervals, is

(a) 98 (b) 96 (c) 100 (d) 99

15. If $\int_a^b f(x)dx$ is numerically integrated by Simpson's rule, then in any pair of consecutive sub-intervals by which of the following curves, the curve $y = f(x)$ is approximated

(a) Straight line (b) Parabola (c) Circle (d) Ellipse

16. If by Simpson's rule $\int_0^1 \frac{1}{1+x^2} dx = \frac{1}{12}[3.1 + 4(a+b)]$ when the interval [0, 1] is divided into 4 sub-intervals and a and b are the values of $\frac{1}{1+x^2}$ at two of its division points, then the values of a and b are the following

(a) $a = \frac{1}{1.0625}, b = \frac{1}{1.25}$ (b) $a = \frac{1}{1.0625}, b = \frac{1}{1.5625}$ (c) $a = \frac{1}{1.25}, b = 1$ (d) $a = \frac{1}{1.5625}, b = \frac{1}{1.25}$

17. If $e^0 = 1, e^1 = 2.72, e^2 = 7.39, e^3 = 20.09$ and $e^4 = 54.60$, then by Simpson's rule, the value of $\int_0^4 e^x dx$ is

(a) 5.387 (b) 53.87 (c) 52.78 (d) 53.17

18. If (2, 6) is divided into four intervals of equal region, then the approximate value of $\int_2^6 \frac{1}{x^2 - x} dx$ using Simpson's rule, is

(a) 0.3222 (b) 0.2333 (c) 0.5222 (d) 0.2555

19. If $h = 1$ in Simpson's rule, the value of $\int_1^5 \frac{dx}{x}$ is

(a) 1.62 (b) 1.43 (c) 1.48 (d) 1.56

20. If successive approximations are given by $x_1, x_2, x_3, ... x_n, x_{n+1}$, then Newton-Raphson formula is given as

(a) $x_{n+1} = x_n + \frac{f(x_{n+1})}{f'(x)}$ (b) $x_{n+1} = x_n + \frac{f(x_n)}{f'(x_n)}$ (c) $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ (d) $x_{n+1} = x_n - \frac{f'(x_n)}{f(x_n)}$

21. Newton-Raphson method is applicable only when

(a) $f(x) \neq 0$ in the neighbourhood of actual root $x = \alpha$ (b) $f'(x) \neq 0$ in the neighbourhood of actual root $x = \alpha$

(c) $f''(x) \neq 0$ in the neighbourhood of actual root $x = \alpha$ (d) None of these

22. Newton-Raphson processes has a

(a) Linear convergence (b) Quadratic convergence (c) Cubic convergence (d) None of these

23. The condition for convergence of the Newton-Raphson method to a root α is

(a) $\frac{1}{2}\frac{f'(\alpha)}{f''(\alpha)} < 1$ (b) $\frac{f'(\alpha)}{f''(\alpha)} < 1$ (c) $\frac{1}{2}\frac{f'(\alpha)}{f''(\alpha)} > 1$ (d) None of these

24. The real root of the equation $x^3 - x - 5 = 0$ lying between –1 and 2 after first iteration by Newton-Raphson method is

(a) 1.909 (b) 1.904 (c) 1.921 (d) 1.940

25. A root of the equation $x^3 - 4x + 1 = 0$ lies between 1 and 2. Its value as obtained by using Newton-Raphson method is

(a) 1.775 (b) 1.850 (c) 1.875 (d) 1.950

26. The value of x_0 (the initial value of x) to get the solution in interval (0.5, 0.75) of the equation $x^3 - 5x + 3 = 0$ by Newton-Raphson method, is

(a) 0.5 (b) 0.75 (c) 0.625 (d) None of these

27. By the false position method, the root of the equation $x^3 - 9x + 1 = 0$ lies in interval (2, 4) after first iteration. It is

(a) 3 (b) 2.5 (c) 3.57 (d) 2.47

28. The formula [where $f(x_{n<1})$ and $f(x_n)$ have opposite sign at each step $n \geq 1$] of method of False position of successive approximation to find the approximate value of a root of the equation $f(x) = 0$ is

(a) $x_{n+1} = x_n - \frac{f(x_n) - f(x_{n-1})}{f(x_n)}(x_n - x_{n-1})$ (b) $x_{n+1} = x_n - \frac{f(x_n)}{f(x_n) - f(x_{n-1})}(x_n - x_{n-1})$

(c) $x_{n+1} = x_n + \frac{f(x_n)+f(x_{n-1})}{f(x_n)}(x_n - x_{n-1})$ (d) $x_{n+1} = x_n + \frac{f(x_n)}{f(x_n)+f(x_{n-1})}(x_n - x_{n-1})$

29. By false positioning, the second approximation of a root of equation $f(x)=0$ is (where x_0, x_1 are initial and first approximations respectively)

(a) $x_0 - \frac{f(x_0)}{f(x_1)-f(x_0)}$ (b) $\frac{x_0 f(x_1) - x_1 f(x_0)}{f(x_1)-f(x_0)}$ (c) $\frac{x_0 f(x_0) - x_1 f(x_1)}{f(x_1)-f(x_0)}$ (d) $x_0 - \frac{f(x_0)}{f(x_1)-f(x_0)}$

30. A root of the equation $x^3 - 18 = 0$ lies between 2 and 3. The value of the root by the method of false position is

(a) 2.526 (b) 2.536 (c) 2.546 (d) 2.556

31. The equation $x^3 - 3x + 4 = 0$ has only one real root. What is its first approximate value as obtained by the method of false position in (–3, –2)

(a) –2.125 (b) 2.125 (c) –2.812 (d) 2.812

32. A root of the equation $x^3 - x - 1 = 0$ lies between 1 and 2. Its approximate value as obtained by applying bisection method 3 times is

(a) 1.375 (b) 1.625 (c) 1.125 (d) 1.25

33. A root of the equation $x^3 - x - 4 = 0$ lies between 1 and 2. Its approximate value, as obtained by applying bisection method 3 times, is

(a) 1.375 (b) 1.750 (c) 1.975 (d) 1.875

34. Performing 3 iterations of bisection method, the smallest positive approximate root of equation $x^3 - 5x + 1 = 0$ is

(a) 0.25 (b) 0.125 (c) 0.50 (d) 0.1875

35. A root of the equation $x^3 - 3x - 5 = 0$ lies between 2 and 2.5. Its approximate value, by applying bisection method 3 times is

(a) 2.0625 (b) 2.3125 (c) 2.3725 (d) 2.4225

36. If for the function $f(x)=0$, $f(a)<0$ and $f(b)>0$, then the value of *x* in first iteration is

(a) $\frac{a+b}{2}$ (b) $\frac{b-a}{2}$ (c) $\frac{2a-b}{2}$ (d) $\frac{2b-a}{2}$

37. Using successive bisection method, a root of the equation $x^3 - 4x + 1 = 0$ lies between 1 and 2, at the end of first interaction, it lies between

(a) 1.62 and 1.75 (b) 1.5 and 1.75 (c) 1.75 and 1.87 (d) None of these

38. The positive root of the equation $e^x + x - 3 = 0$ lies in the interval

(a) (0, 1) (b) (1, 2) (c) (2, 3) (d) (2, 4)

39. The positive root of the equation $x^3 - 2x - 5 = 0$ lies in the interval

(a) (0, 1) (b) (1, 2) (c) (2, 3) (d) (3, 4)

40. One real root of the equation $x^3 - 5x + 1 = 0$ must lie in the interval

(a) (0, 1) (b) (1, 2) (c) (–1, 0) (d) (–2, 0)

41. The number of positive roots of the equation $x^3 - 3x + 5 = 0$ is

(a) 1 (b) 2 (c) 3 (d) None of these

42. Let $f(x)=0$ be an equation and x_1, x_2 be two real numbers such that $f(x_1)f(x_2)<0$, then

(a) At least one root of the equation lies in the interval (x_1, x_2)

(b) No root of the equation lies in the interval (x_1, x_2)

(c) Either no root or more than one root of the equation lies the interval (x_1, x_2)

(d) None of these

43. Let $f(x)=0$ be an equation let x_1, x_2 be two real numbers such that $f(x_1)f(x_2)>0$, then

(a) At least one root of the equation lies in (x_1, x_2)

(b) No root of the equation lies in (x_1, x_2)

(c) Either no root or an even number of roots lie in (x_1, x_2)

(d) None of these

44. If for $f(x)=0$, $f(a)<0$ and $f(b)>0$, then one root of $f(x)=0$ is

(a) Between *a* and *b* (b) One of from *a* and *b*

(c) Less than *a* and greater than *b* (d) None of these

45. If $f(a)f(b) < 0$, then an approximate value of a real root of $f(x) = 0$ lying between *a* and *b* is given by

(a) $\frac{af(b) - bf(a)}{b - a}$ (b) $\frac{bf(a) - af(b)}{b - a}$ (c) $\frac{af(b) - bf(a)}{f(b) - f(a)}$ (d) None of these

46. A decimal number is chopped off to four decimal places, then the absolute value of the relative error is not greater than

(a) 10^{-2} (b) 10^{-3} (c) 10^{-4} (d) None of these

47. If e_1 and e_2 are absolute errors in two numbers n_1 and n_2 respectively due to rounding or truncation, then $\left|\frac{e_1}{n_1} + \frac{e_2}{n_2}\right|$

(a) Is equal to $e_1 + e_2$ (b) Is less then $e_1 + e_2$

(c) Is less then or equal to $e_1 + e_2$ (d) Is greater then or equal to $e_1 + e_2$

48. In general the ratio of the truncation error to that of round off error is

(a) 1 : 2 (b) 2 : 1 (c) 1 : 1 (d) None of these

49. The equation $e^{-2x} - \sin x + 1 = 0$ is of the form

(a) Algebraic (b) Linear (c) Quadratic (d) Transcendental

50. The root of the equation $x^3 - 6x + 1 = 0$ lies in the interval

(a) (2, 3) (b) (3, 4) (c) (3, 5) (d) (4, 6)