Series solution of second order ordinary differential equations

1. The power series method is the standard method for solving linear ODEs ............
2. Linear second order ordinary differential equation is non homogeneous if .........
3. Method which gives solution in the form of power series is called .............
4. Frobenious method extend the ............
5. From calculus, power series is ............
6. The series solution for the differential equation $y'' - xy = 0$ is ..............
7. The series solution for the differential equation $y'' - 2xy' + 8y = 0$ is .............
8. The series solution for the differential equation $y'' + y = 0$ is .............

Special functions

9. What is the value of $\int_0^\infty \sqrt{x} e^{-x^3} \, dx$ ............
10. What is the value of $\int_0^1 \sqrt{-\ln x} \, dx$ ............
11. What is the value of $\int_0^1 \frac{1}{\sqrt{-\ln x}} \, dx$ ............
12. Which of the following is true?
13. $\Gamma(n+1) = n!$ can be used when ............
14. Which of the following is not a definition of Gamma function?
15. What is the value of $\Gamma\left(\frac{1}{2}\right)$?
16. Is the given statement true or false? $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$
   A. True
   B. False
17. What is the value of $\Gamma\left(\frac{3}{2}\right)$?
18. What is the value of $\int_0^\infty e^{-x^2} \, dx$ ?
19. What is the value of $\int_0^1 \frac{1}{\sqrt{-\ln x}} \, dx$ ?
20. What is the value of $\int_0^\infty e^{-\frac{3}{\sqrt{x}}} \sqrt{x} \, dx$ ?
21. Is the given statement true or false? \( \Gamma \left( n + \frac{1}{2} \right) = \frac{\sqrt{\pi}}{2^n n!} (2n)! \)
   a. True
   b. False

22. What is the value of \( \Gamma \left( \frac{9}{4} \right) \)?

23. \( \beta (m, n) = - \beta (n, m) \), Is the statement true?
   a) True
   b) False

24. Which of the following is \textbf{not} the definition of Beta function?

25. What is the value of \( \int_0^{\pi/2} \sqrt{\sin 2x} \, dx \)?

26. What is the value of \( \int_0^\infty \frac{1}{1+x^2} \, dx \)?

27. What is the value of \( \int_0^\infty \frac{\sqrt{x}}{(1+y)^2} \, dx \)?

28. What is the value of \( \int_0^\infty e^{-5t} (1 - e^{-t})^n \, dt \)?

29. What is the value of \( \int_0^1 \sqrt{u} \sqrt{1-u} \, du \)?

30. What is the value of \( \beta (3, 2) \)?

31. What is the value of \( \beta (1/4, 3/4) \)?

32. Solve using the Beta function. \( \int_0^1 x^{-2} (1 - x)^{-3} \, dx \).

33. The differential equation \( x^2 y''(x) + x y'(x) + (x^2 - n^2)y(x) = 0 \) is ..........

**Fourier series**

34. The two function \( f_1 (x), f_2 (x) \) are orthogonal on \([a, b]\) when ..........

35. The set of functions \( \{ \sin mx \}, m = 1, 2, 3, ... \) are orthogonal on the interval \([-\pi, \pi]\) when ...........

36. The norm of the function \( \sin nx \) on the interval \([-\pi, \pi]\) is equal ...........

37. The norm of the function \( \cos nx \) on the interval \([-\pi, \pi]\) is equal ...........

38. The functions \( \{ f_n (x) \}, n = 0, 1, ..., \) are orthogonal on \([a, b]\) when ...........

39. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^\infty a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \), if \( f(x) \) is odd ,then ........

40. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^\infty a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \), if \( f(x) \) is even ,then ........
41. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi}{L} x + b_n \sin \frac{n\pi}{L} x \), and \( f(x) = x \), 
\(-\pi < x < \pi\), the value of Fourier series of \( f(x) \) when \( x = 0 \) is …………..

42. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi}{L} x + b_n \sin \frac{n\pi}{L} x \), and \( f(x) = x \), 
\(-\pi < x < \pi\), the value of Fourier series of \( f(x) \) when \( x = \pi \) is …………..

43. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi}{L} x + b_n \sin \frac{n\pi}{L} x \), and \( f(x) = x \), 
\(-\pi < x < \pi\), the value of Fourier series of \( f(x) \) when \( x = \frac{\pi}{2} \) is …………..

44. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi}{L} x + b_n \sin \frac{n\pi}{L} x \), and \( f(x) = x \), 
\(-\pi < x < \pi\), the value of Fourier series of \( f(x) \) when \( x = 2\pi \) is …………..

45. Let \( f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi}{L} x + b_n \sin \frac{n\pi}{L} x \), and \( f(x) = x \), 
\(-\pi < x < \pi\), the value of Fourier series of \( f(x) \) when \( x = \frac{5}{2}\pi \) is …………..

46. The two functions \( x \) and \( \cos x \) are orthogonal on the interval \([-1, 1]\)

A. True
B. False

47. A periodic function is given by a function which \( f(x + T) = f(x) \)

A. True
B. False

48. An even function is expanded by cosine functions only in Fourier series.

A. True
B. False

49. An odd function is expanded by cosine functions only in Fourier series.

A. True
B. False

**Partial differential equation**

50. The PDE \( u_t = t \ u_{xx} + u_{xxx} + x^2 u \) is …………..

51. The PDE \( u_t = t \ u_{xx} + u u_{xxx} + x^2 u \) is …………..

52. The PDE \( 2 \ u_{xx} + 3 u_{xy} - u_{yy} + 3 u = 0 \) is …………..
53. The PDE \( y \, u_{xx} + 4u_{xy} + xu_{yy} = 0 \) is …………

54. The PDE \( u_{xx} + u_{xxx} + u_{yy} + x^2u = x^2 + y \) is …………

55. While solving a partial differential equation using a variable separable method, we assume that the function can be written as the product of two functions which depend on one variable only

A. True
B. False

56. While solving a partial differential equation using a variable separable method, we equate the ratio to a constant which?

57. The partial differential equation \( u_t = u_{xx} \) is classified as …………

58. The partial differential equation \( u_{tt} = u_{xx} \) is classified as …………

59. The partial differential equation \( u_{xx} + u_{yy} = 0 \) is classified as …………

60. A partial differential equation requires …………