1. Find the sum of the order and the degree of the differential equation

$$\left(x + \frac{dy}{dx}\right)^2 = \left(\frac{dy}{dx}\right)^2 + 1 \tag{1}$$

2. If $\frac{d}{dx}[f(x)] = \frac{\sec^4 x}{\csc^4 x}$ and $F\left(\frac{\pi}{4}\right) = \frac{\pi}{4}$, then find $F(x)$.

3. Find : $\int \frac{\log x - 3}{(\log x)^4} dx$

4. Find : $\int \frac{dx}{\sqrt{x} + \sqrt[3]{x}}$

5. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\cos x}{(1+\sin x)(4+\sin x)} dx$

6. Evaluate : $\int_0^\pi \frac{x}{1+\sin x} dx$

7. Using integration, find the area of the region enclosed by the curve $y = x^2$, the x-axis and the ordinates $x = -2$ and $x = 1$

8. Using integration, find the area of the region enclosed by the line $y = \sqrt{3}x$, semi-circle $y = \sqrt{4 - x^2}$ and x-axis in first quadrant.

9. Find the product of the order and the degree of the differential equation $[\frac{d}{dx}(xy^2)].\frac{dy}{dx} + y = 0$

10. Find : $\int \frac{\sqrt{\cot x}}{\sin x \cos x} dx$

11. Find : $\int \frac{1}{x(x^2+4)} dx$

12. Evaluate : $\int_0^1 \tan^{-1} x \, dx$

13. Find : $\int \frac{2x}{x^2+3x+2} dx$

14. Solve the following differential equation : $(1 + e^{\frac{y}{x}})dy + e^{\frac{y}{x}}\left(1 - \frac{y}{x}\right) dx = 0$

15. Evaluate : $\int_0^1 x(1 - x)^n dx$

16. Using integration, find the area of the smaller region enclosed by the curve $4x^2 + 4y^2 = 9$ and the line $2x + 2y = 3$

17. If the area of the region bounded by the curve $y^2 = 4ax$ and the line $x = 4a$ is $\frac{256}{3}$ sq. units, then using integration, find the value of a, where $a > 0$.

18. Find the general solution of the differential equation : $\frac{dy}{dx} = \frac{3e^{2x}+3e^{4x}}{e^x+e^{-x}}$

19. Find : $\int \frac{dx}{x^2-6x+13}$

20. Find the particular solution of the differential equation $x\frac{dy}{dx} - y = x^2.e^x$, given $y(1) = 0$

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21. Find the general solution of the differential equation
$$x\frac{dy}{dx} = y(\log y - \log x + 1) \tag{2}$$

22. Evaluate : $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (\sin |x| + \cos |x|)dx$

23. Find : $\int \frac{x^2}{(x^2+1)(3x^2+4)}dx$

24. Evaluate : $\int_{-2}^{1} \sqrt{5 - 4x - x^2}dx$

25. Find the area of the region enclosed by the curves $y^2 = x, x = \frac{1}{4}, y = 0$ and $x = 1$, using integration.

26. Evaluate :
$$\int_0^1 x^2 e^x dx \tag{3}$$

27. Find the general solution of the differential equation
$$\sec^2 x. \tan y dx + \sec^2 y. \tan x dy = 0 \tag{4}$$

28. If the area of the region bounded by the line $y = mx$ and the curve $x^2 = y$ is $\frac{32}{3}$ sq. units, then find the positive value of m, using integration.

29. Find :
$$\int \frac{1}{e^x + 1}dx \tag{5}$$

30. Evaluate :
$$\int_1^4 \{|x| + |3 - x|\}dx \tag{6}$$

31. Evaluate :
$$\int_{-3}^3 \frac{x^4}{1 + e^x}dx \tag{7}$$

32. Find the particular solution of the differential equation $x\frac{dy}{dx}+y+\frac{1}{1+x^2} = 0$, given that $y(1) = 0$

33. Find the general solution of the differential equation
$$x(y^3 + x^3)dy = (2y^4 + 5x^3y)dx \tag{8}$$

34. Find : $\int \frac{dx}{\sqrt{4x-x^2}}$

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35. Find the general solution of the following differential equation :

$$\frac{dy}{dx} = e^{x-y} + x^2 e^{-y} \tag{9}$$

36. Let X be a random variale which assumes values x_1, x_2, x_3, x_4 such that $2P(X = x_1) = 3P(X = x_2) = P(X = x_3) = 5P(X = x_4)$. Find the probability distribution of X.

37. Find :

$$\int e^x . \sin 2x dx \tag{10}$$

38. Find :

$$\int \frac{2x}{(x^2 + 1)(x^2 + 2)} dx \tag{11}$$

39. Evaluate : $\int_1^3 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{4-x}}$

40. Solve the following differential equation:

$$(y - \sin^2 x)dx + \tan x dy = 0 \tag{12}$$

41. Find the general solution of the differential equation:

$$(x^3 + y^3)dy = x^2 y dx \tag{13}$$

42. Find : $\int \frac{1}{\sqrt{12+4x-x^2}} dx$

43. Find : $\int \frac{xe^x}{(x+4)^5} dx$

44. Find the general solution of the following differential equation :

$$(4 + y^2)(3 + \log x)dx + x dy = 0 \tag{14}$$

45. Evaluate : $\int_0^{\frac{\pi}{3}} |\cos 3x| dx$

46. Find the general solution of the following differential equation :

$$2xe^{\frac{y}{x}} dy + (x - 2ye^{\frac{y}{x}})dx = 0 \tag{15}$$

47. Find the particular solution of the differentila equation $(2x^2 + y).\frac{dx}{dy} = x$; given that $y = 2$ when $x = 1$

48. Find : $\int \frac{x^2+x+1}{(x+1)(x^2+4)} dx$

49. Find the area bounded by the ellipse $x^2 + 4y^2 = 16$ and the ordinates $x = 0$ and $x = 2$, using integration.

50. Find the area of the region $\{(x, y) : x^2 \le y \le x\}$, using integration.

51. $\int_0^{\frac{\pi}{2}} \frac{1}{1+\sqrt{\cot x}} dx$ is equal to

 (a) $\frac{\pi}{3}$
 (b) $\frac{\pi}{6}$
 (c) $\frac{\pi}{4}$
 (d) $\frac{\pi}{2}$

52. Find :

$$\int \frac{(x+2)(x+2\log x)^3}{x} dx \tag{16}$$

53. Evaluate :

$$\int_0^{\frac{\pi}{2}} \log(\tan x) dx \tag{17}$$

54. Evaluate :

$$\int_{-1}^{2} |x| dx \tag{18}$$

55. Find :

$$\int x^2 \log x . dx \tag{19}$$

56. Find the general solution of the following differential equation :

$$\frac{dy}{dx} = (1+x)(1+y) \tag{20}$$

57. Find the integrating factor for the following differential equation :

$$\frac{dy}{dx} + y \cot x = 2x + x^2 \cot x (x \ne 0) \tag{21}$$

58. Find :

$$\int \frac{x}{(x-1)^2(x+2)} dx \tag{22}$$

59. Solve the following differential equations :

$$x \cos \left(\frac{y}{x}\right) \frac{dy}{dx} = y \cos \left(\frac{y}{x}\right) + x \tag{23}$$

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60. If $\int \frac{\cos 8x + 1}{\tan 2x - \cot 2x} dx = \lambda \cos 8x + c$, then the value of λ is

(a) $\frac{1}{16}$

(b) $\frac{1}{8}$

(c) $\frac{-1}{16}$

(d) $\frac{-1}{8}$

61. $\int_0^1 \tan(\sin^{-1} x) dx$ equals

(a) 2

(b) 0

(c) -1

(d) 1

62. The integrating factor of the differential equation $x \frac{dy}{dx} - y = \log x$ is?

63. Find the solution of the differential equation $\log \frac{dy}{dx} = ax + by$.

64. Solve the following homogeneous differential equation :

$$x \frac{dy}{dx} = x + y \tag{24}$$

65. Evaluate $\int_1^3 (x^2 + 1 + e^x) dx$ as the limit of sums.

66. If the area between the curves $x = y^2$ and $x = 4$ is divided into two equal parts by the line $x = a$, then find the value of a using integration.

67. Find :

$$\int \frac{x}{(x-1)^2(x+2)} dx \tag{25}$$

68. Evaluate :

$$\int_0^1 \frac{xe^x}{(x+1)^2} dx \tag{26}$$

69. Solve the following differential equation :

$$\frac{dy}{dx} = e^{x+y} + x^2 e^y \tag{27}$$

70. The supply function of a commodity is $100p = (x + 20)^2$. Find the Producer's Surplus (PS), when the market price is ₹ 25

71. Find :

$$\int \frac{2x^2 + 1}{x^2 - 3x + 2} dx \tag{28}$$

72. In a certain culture of bacteria, the rate of increase of bacteria is proportional to the number present. It is found that there are 10,000 bacteria at the end of 3 hours and 40,000 bacteria at the end of 5 hours. determine the numer of bacteria present in the beginning.