Exercise

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1. Find $\dfrac{d}{dx}\left(\displaystyle\int f(x)\,dx\right)$

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2. What is the value of
$$\int \frac{d}{dx} f(x)\,dx - \frac{d}{dx}\int f(x)\,dx?$$

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3. Evaluate the $\int \left(\sqrt{1 - x^2} + \dfrac{x^2}{\sqrt{1 - x^2}} \right) dx$

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4. Evaluate the $\int \dfrac{x^4 + x^3 + x^2 + x + 2}{x^2 + 1} dx$

5. Evaluate the $\int \dfrac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x} dx$

6. State as true or false: All functions are integrable.

7. State as true or false: The integral of a function is not unique.

8. State as true or false: If $\dfrac{d}{dx}\displaystyle\int f(x)\,dx = \dfrac{d}{dx}\displaystyle\int g(x)\,dx$ then $\displaystyle\int f(x)\,dx - \displaystyle\int g(x)\,dx = c$ Where c is constant.

9. State as true or false: Integral of a constant function w.r.t.x is zero.

10. Evaluate : $\int \dfrac{1}{x(Inx)^2} dx$

11. Evaluate: $\int \dfrac{x^3}{x+2} dx$

12. Evaluate: $\int \left(1 - \dfrac{1}{x^2} \right) e^{x + \frac{1}{x}} \, dx$

13. Evaluate: $\int \dfrac{1}{x \cos^2 (1 + \log x)} \, dx$

14. Evaluate: $\int \dfrac{\sec^2 x}{\tan^2 x + 4} \, dx$

15. Evaluate $\displaystyle\int \frac{3x + 4}{x^2 + 4}\,dx.$

16. If

$$\int \frac{x}{(x - 1)(2x - 1)} = \int \left[\frac{A}{x - 1} + \frac{B}{2x - 1} \right] dx$$

find A and B.

17. If $\displaystyle\int \frac{3x-1}{x^2-1} dx = \int \left(\frac{A}{x-1} + \frac{B}{x+1} \right) dx$

find A and B.

18. If

$$\int \frac{x}{(x-1)(2x-1)} = \int \left[\frac{A}{x-1} + \frac{B}{2x-1} \right] dx$$

find A and B.

19. If $\int \dfrac{3x-1}{x^2-1}dx = \int \left(\dfrac{A}{x-1} + \dfrac{B}{x+1} \right) dx$

find A and B.

20. What is $F'(x)$ if $F(x) = \displaystyle\int_0^x e^{3t} \cos 4t \, dt$?

21. If f(x+y) = f(x) f(y) for all x,y and if f(5) = 2

and f(0) = 3, then what is the value of f '(5)?

22. Find: $\dfrac{d}{dx}\left(\displaystyle\int_a^x \sin t\, dt\right)$

23. Evaluate: $\displaystyle\int_{-1}^1 (|x| + |x - 1|)\, dx$

24. Evaluate: $\displaystyle\int_{-1}^1 |2x + 1|\, dx$

25. Evaluate $\displaystyle\int_{-1}^{1} \left(|x| + x\right)^2 dx$

26. Evaluate $\displaystyle\int_{0}^{-\pi/2} (4 + 5\sin x)\,dx$

27. Evaluate $\displaystyle\int_0^1 e^x\{f(x) + f'(x)\}dx$ where f(1)=f(0)=1

28. Evaluate $\displaystyle\int_{-1}^1 \sin^5 x \cos^4 x dx$.

29. If f(x) = $\displaystyle\int_0^x t \sin t dt$ then find f'(x).

30. Find the Oder and degree,if defined,of each of the differential equation:

$$xy\frac{d^3y}{dx^3} + x\left(\frac{dy}{dx}\right)^3 + y\frac{dy}{dx} = 0$$

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31. Find the Oder and degree,if defined,of each of the differential equation:$\tan^{-1}\sqrt{\frac{dy}{dx}}$

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32. Solve $\dfrac{dy}{dx} = (e^x + 1)y.$

33. Solve the following differential question:

$$\frac{d^2y}{dx^2} = 0,$$

$$\frac{d^2y}{dx^2} = a, \ 'a' is arbitrary cons \tan t.$$

34. Write simplest integrating factor of:

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

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35. Determine the integrating factor for the differential equation:

$$\frac{dy}{dx} - 3y \cot x = \sin 2x.$$

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36. Find Integrating factor of:

$$(x \log x) \frac{dy}{dx} + y = 2 \log x$$

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37. Reduce the different equation:

$$x \frac{dy}{dx} + y = xy^2 \text{into linear from.}$$

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38. Show that the differential equation $(x - y)\dfrac{dy}{dx} = X + 2y$ is homogeneous and find its degree.

39. solve the differential equation:`dy/dx=3x-y-4/2y+x+3

40. Write the solution of the differential equation: $\dfrac{dy}{dx} = \dfrac{y}{x}$.

41. Evaluate the integral: $\displaystyle\int x \cos^3 x^2 \sin x^2\, dx$

42. Evaluate the integral: $\displaystyle\int x^3 \tan^4 x^4 \sec^2 x^4\, dx$

43. Evaluate the integral: $\int \dfrac{dx}{7x\sqrt{(2x^4 - 4)}}$

44. Perform the integration:

$\int \cos x \cos 2x \cos 3x \, dx$

45. Perform the integration: $\int \dfrac{\cos^9 x}{\sin x}\,dx$

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46. Perform the integration: $\int \dfrac{\cos 2x - \cos 2a}{\cos x - \cos a}\,dx$

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47. Evaluate the integral: $\int \dfrac{x^2 - 4}{x - 2}\,dx$

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48. Evaluate the integral: $\int \dfrac{dx}{\sin^2 x \left(\cot^2 x + 2\right)}$

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49. Evaluate the integral: $\int \dfrac{\tan x \, dx}{a + b \tan^2 x}$

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50. Evaluate: $\int \dfrac{Inx}{x^2} dx$

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51. $\int \dfrac{\left(x^2 + 1\right)e^x}{\left(x + 1\right)^2}\,dx$

52. Evaluate: $\int \sqrt{4 - x^2}\,dx$

53. Evaluate: $\int \sqrt{x^2 + 2x + 5}\,dx$

54. $\int \sec^2 \theta \sqrt{\sec^2 \theta + 3} d\theta$

55. Evaluate: $\int \cos \theta \sqrt{4 - \sin^2 \theta} d\theta$

56. Evaluate: $\int (6x + 11) \sqrt{3x + 4} dx$

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

58. Evaluate $\int \dfrac{dx}{(x+1)\sqrt{1-x^2}}$

59. Evaluate : $\int_0^{\pi/2} \sin^4 t\, dt$

60. Evaluate: $\int_0^{\pi/2} \left(a\cos^2 x + b\sin^2 x\right) dx$

61. Evaluate: $\int_{\pi/4}^{\pi/2} \cos\theta \cdot \cos ec^2\theta \, d\theta$

62. $\dfrac{\int_1}{(x+1)(x+2)} dx$

63. Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{\cos^5 x}{\sin^5 x + \cos^5 x} dx.$

64. Find the area of the region enclosed by

$x = 1 + y^2, X = 0, y = 3, y = 6$

65. Find the area of the region enclosed by

$$y^2 = 4x, X = 0, y = 0, y = 4$$

66. Find the area of the region enclosed by

$$y^2 = x, x = 0, y = 2$$

67. Solve the following differential equation:

$$\frac{dy}{dx} + \frac{2x}{1 + x^2}y = \frac{x^3}{1 + x^2}$$

68. Solve the following differential equation :

$$\left(1 + y^2\right)dx = \left(\tan^{-1}y - x\right)dy$$

69. Solve the following differential equation:

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

70. Solve the following differential equation:

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

71. Write the degree of differential equation:

$$\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x\log\left(\frac{d^2y}{dx^2}\right).$$

72. Find the equation of a curve passing through the point(0,-2),given that at any point(x,y)of the curve,the product of the slope of its tangent and y-cordinate of the point is equal to the x co-ordinate of the point.

73. Solve each of the following differential equations :

$$x \cos y dy = (xe^x \log x + e^x) dx.$$

74. If $\dfrac{dy}{dx} = -\dfrac{y^2}{100}$ and y(0)=15,find the value of x when y=10.

75. If $\dfrac{dT}{dt} = -K(T-S)$where K and S are constants,find T when T(0)=100.

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76. If $\dfrac{dC}{dx} = 2 + 0.15x$find C(x)given that C(0)=150.

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77. Evaluate: $\displaystyle\int\dfrac{x^2}{x^4 + x^2 + 1}dx$

78. Evaluate: $\int (4x^5)\, dx$

79. $\int \dfrac{x}{(a^2 - x^2)(x^2 - b^2)}\, dx$

80. Evaluate $\int \dfrac{dx}{(x + 1)\sqrt{1 - x^2}}$

81. $\int \dfrac{x^2 + 2x + 1}{\sqrt{x + 4}} dx$

82. Evaluate: $\int \dfrac{3 + 2\cos x + 4\sin x}{2\sin x + \cos x + 3} dx$

83. Evaluate: $\int \dfrac{2}{1 - \cos 2x} dx$

84. Evaluate the following integrals :

Evaluate $\displaystyle\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x}$

85. $\displaystyle\int_0^{\pi} \frac{x \sin x \, dx}{1 + \cos^2 x}$

86. $\displaystyle\int_0^\pi \left(\frac{x \tan x}{\sec x + \tan x} \right) dx$

87. Find the area of the smaller region lying above x-axis and included between the ciecle $x^2 + y^2 = 2x$ and the parabola $y^2 = x$

88. Solve ⋮

$$(4x + y + 9)dx + (x + 2y + 6)dy = 0$$

89. Solve: $x\dfrac{dy}{dx} + y = y^2 \ln x$