



MATHS

BOOKS - ARIHANT PRAKASHAN

DIFFERENTIAL EQUATIONS

Topic 1 Practice Question 1 Mark Questions

1. Write the order of the differential equation whose solution is given by

$$y = (c_1 + c_2)\cos(x + c_3) + c_4e^{x + c_5}$$

where c_1, c_2, c_3, c_4 and c_5 are arbitrary constants



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2. If P and q are respectively degree and order of the differential. Equation $y = e^{dy/dx}$, then write the relation between P and q .



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3. Write the order of the differential equation of the family of circles

$$ax^2 + ay^2 + 2gx + 2fy + c = 0.$$



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4. if P and q are the order and degree of the differential equation

$$y \left(\frac{dy}{dx} \right)^2 + x^2 \frac{d^2y}{dx^2} + xy = \sin x,$$

then choose the correct statement out of

$$P > q$$

$$P=q$$

$$P < q$$



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5. Write the order of the differential equation

of the system of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.



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6. Write the differential equation of the family

of straight lines parallel to the y-axis.



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7. Write the degree of the differential equation

$$\ln\left(\frac{d^2y}{dx^2}\right) = y.$$



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8. Write the particular solution of the

equation $\frac{dy}{dx} = \sin x$, given that $y(\pi) = 3$.



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9. Determine the order and degree of the

differential equation $\left(\frac{d^2y}{dx^2}\right) = \left(\frac{dy}{dx}\right)^4$



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10. Write the order of the differential equation

whose general solution is $y = ax^2 + b$, where

a and b are arbitrary constants.



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11. Write the order and the degree of the following differential equation.

$$\frac{d^3y}{dx^3} = \left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^4 + y$$



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12. Write the particular solution of

$$\frac{dy}{dx} = (x)^4, y = 0, \text{ when } x = -1.$$



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13. Form the differential equation , whose solution is $y = e^{x+a}$



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14. Write the particular solution of $\frac{dy}{dx} = (1 + x^2)$ given that $y=1$, when $x=0$.



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15. Given the general solution as $y = e^x$ of a differential equation . What is the particular solution, if $y=0$, when $x=1$?



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16. Write the order and degree of the differential equation $\left(\frac{dy}{dx}\right)^5 = \left(\frac{d^2y}{dx^2}\right)^3$



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17. Write the order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2} + \frac{dy}{dx}\right)^5 + \left(\frac{d^3y}{dx^3}\right)^2$$



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18. Obtain the differential equation whose primitive is $y = Ae^{2x} + Be^{-2x}$.



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19. Write the particular solution of $\frac{dy}{dx} = 8x$, given that $y=2$, when $x=1$.



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20. Write the differential equation of the parabola.

$$y^2 = 4x + 12.$$



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21. Write the differential equation whose general solution is $y = 3x + 2$



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22. Write the order and degree of the differential equation

$$\left(\frac{dy}{dx}\right)^8 + \left(\frac{d^2y}{dx^2}\right)^2 = 0.$$



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23. Write the solution of $\frac{d^2u}{dt^2} = 0$.



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24. Write the degree and order of the

differential equation $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2 + 1$.



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25. Form the differential equation of $y = e^{mx}$.



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26. Solve $\frac{dy}{dx} = x$,



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27. Find the order and degree of a differential

equation $\left(\frac{d^2y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) + 3y = 0$.



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1. Find differential equation of the curve

$$y = ae^{3x} + be^{5x}.$$



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2. From the differential equation whose general solution is $y = a \sin t + be^t$.



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



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4. Find the particular solution of the differential equation $\frac{d^2y}{dx^2} = 6x$, . Given that $y=1$ and $\frac{dy}{dx} = 2$, when $x=0$ at Y-axis.



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5. Solve the following differential equation

$$x^2 dx + y^2 dy = 0.$$



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6. Find the differential equation whose general solution is $ax^2 + by = 1$, where a and b are arbitrary constants.



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7. Solve $\frac{dy}{dt} = e^{2t+3y}$.



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8. Find the differential equation whose general solution is $y = a \cos x + b \sin x$.



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9. Find the particular solution of the differential equation

$$\frac{dy}{dx} + \frac{1 + y^2}{1 + x^2} = 0, y(-1) = -\sqrt{3}.$$



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10. Find the differential equation whose general solution is $C_1x^2 + C_2y^2 = 1$, where C_1 and C_2 are arbitrary constants.



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11. Find the differential equation whose general solution is $ax^2 + by = c$.



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12. Solve the following differential equation

$$x dx + y^2 dy = 0$$



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13. Solve $\frac{d^2y}{dx^2} = e^{2x}$



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14. Find the solution of $\frac{dy}{dx} = 3$



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15. Solve $\frac{d^2y}{dx^2} = x + 2, \quad \cdot$



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16. Solve $\frac{dy}{dx} = \frac{x}{3y^2 + 4y}$



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17. Solve the following differential equation

$$2dy + dx = 0.$$



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18. Form the differential equation whose general solution is $y = ae^x + bx$



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19. Find the differential equation whose general solution is $y = at + be^t$



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20. Solve $(x^2 + 1) \frac{dy}{dx} + 4x^2y = 0$.



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21. Solve $\frac{dy}{dx} = x + 1$.



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22. Solve $\frac{dy}{dx} = \cos 2x \cos x$, if $y=2$, when $x = 0$.



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23. Solve $\frac{dy}{dx} = \frac{1 + y^2}{\sqrt{1 - x^2}}$, If $y = 1$, when $x=0$.



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24. Prove that $y=ax + \frac{b}{a}$ is a solution of the differential equation $y = x \frac{dy}{dx} + b \frac{dx}{dy}$



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25. Solve $\frac{dy}{dx} + \frac{1 + y^2}{y} = 0$.



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26. Solve $\frac{dy}{dx} + \frac{\sin y}{\cos x} = 0$.



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27. Solve $\log \left(\frac{d^2y}{dx^2} \right) + x = 0$, given that $y=0$ and $\frac{dy}{dx} = 0$, when $x=0$.



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28. Solve $\frac{dy}{dx} = x \ln x$.



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29. Solve $\frac{dy}{dt} = t \ln t$.



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30. Solve $y dy + \sin x dx = 0$.



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31. Solve $x^2 dy - dx = 0$.



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32. Verify that, $y^2 = 4\alpha x$ is a solution of the differential equation $y = x \frac{dy}{dx} + \alpha \frac{dx}{dy}$.



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33. Solve $e^x \tan y \, dx + (1 - e^x) \sec^2 y \, dy = 0$.



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Topic 1 Practice Question 6 Mark Questions

1. Solve $(4x + 5)dx - (3y + 4)dy = 0$.



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2. Solve $\frac{dy}{dx} = \frac{1}{x^2 + 1}$



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3. Solve the following differential equation $(2x + 1)dx + (2y - 1)dy = 0$.



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4. Solve $\frac{d^2y}{dx^2} = \sin x + \sec^2 x + 9e^{-3x}$



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5. Form the differential equation representing the family of curves $y^2 - 2ay + x^2 = a^2$,

where a is an arbitrary constant.



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Topic Test 1

1. Find the order and degree of a the

differential equation $\left(\frac{dy}{dx}\right)^4 + y^5 = \frac{d^3y}{dx^3}$.



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2. Find the order and degree of the differential

equation $e^{\frac{dy}{dx}} = x^2$.



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3. Find order and degree of the differential

equation $\tan^{-1} \sqrt{\frac{dy}{dx}} = x$.



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4. Find the order and degree of the differential

equation $\left(\frac{d^2y}{dx^2}\right) = \frac{dy}{dx}$.



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5. Form the differential equation by eliminating the arbitrary constants in each of the following cases.

$$y = a \sin^{-1} x + b \cos^{-1} x$$



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6. Form the differential equation by eliminating the arbitrary constant in the equation. $y = Ax + A^3$



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7. Write the differential equation of circles passing through the origin and having their centre on the x-axis.



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8. Find the general solution of the differential

equation $\frac{dy}{dt} = t^3$



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9. Find the general solution of the differential

equation $\frac{dy}{du} = (u + 1)$.



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10. Find the solution of the differential

equation $\frac{d^2y}{dx^2} + 2 = 0$.



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11. Find the particular solutions of the differential equation $\frac{dy}{dx} = \cos x$, Given that $y=2$, then $x=0$.



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12. Solve the given second order equation

$$\frac{d^2y}{dx^2} = \sec^2 x + \cos x.$$



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13. Solve $dy + (y^2 + 1)dx = 0$.



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14. Obtain the general solution of the following differential equations.

$$(x^2 + 7x + 12)dy + (y^2 - 6y + 5)dx = 0$$



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15. Find the particular solutions of the following equation subject to the given conditions.

$$\frac{dy}{dt} = \cos^2 y \text{ subject to } y = \frac{\pi}{4}, \text{ when } t=0.$$



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Topic 2 Practice Questions 1 Mark Questions

1. Reduce the following to a linear differential

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



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2. Write an integrating factor of the differential equation $\frac{dy}{dx} = -xy$



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3. Find an integrating factor of the differential equation $(x + \tan y) dy = \tan y dx$.



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4. Write an integrating factor of the following differential equation .

$$(1 + y^2)dx + xdy = \tan^{-1} ydy$$



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5. Write an integrating factor of the equation

$$\frac{dy}{dx} - \frac{y}{x} = 1$$



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6. Find the factor that should be multiplied with the differential equation $\cos x \frac{dy}{dx} + y \sin x = 3$ to make it integrable.



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7. Write an integrating factor of $\frac{dy}{dx} + xy = 0$.



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8. If the homogeneous form of the differential

equation $\frac{dy}{dx} = \frac{x + y + 1}{x - y + 1}$ is

$\frac{dY}{dX} = \frac{X + Y}{X - Y}$ then what is the relation

between Y and y?



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9. Write the integrating factor of

$$\frac{dy}{dx} + y \sec x = \tan x.$$



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10. Find the integrating factor of

$$\frac{dy}{dx} + y = e^{-x}.$$



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Topic 2 Practice Questions 4 Mark Questions

1. Find the integrating factor of the following differential equation .

$$ydx + xdy = 0.$$



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2. Solve the following differential equation

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



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3. Solve: $(x^2 - 1) \frac{dy}{dx} + 2xy = 1$



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4. Solve $2ydy + xdx=0$.



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5. Solve $\frac{dy}{dx} + y = e^{-x}$



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6. Solve $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$.



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



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8. Solve $\frac{dy}{dx} = \frac{y^2}{xy - x^2}$.



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9. Solve $\frac{dy}{dx} = \frac{x^2 + y^2}{xy}$



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10. Find the integrating factor for the solution

of the differential equation $\frac{dy}{dx} = -yx$.



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11. Find the general solution of $y \frac{dx}{dy} + x = y$.



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12. Solve $(3x^2)dx + 4ydy = 0$.



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13. Solve $\frac{dy}{dx} - \frac{y}{x} = 2x$.



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Topic 2 Practice Questions 6 Mark Questions

1. Solve $x^2 \frac{dy}{dx} = x$



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2. Solve $x dy - y dx = 0$



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3. Solve $\frac{dy}{dx} = \frac{3x - 7y + 7}{3y - 7x - 3}$.



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4. Solve the following differential equations.

$$(x + \tan y)dy = \sin 2y dx$$



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



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6. Solve $(x-y + 1) dx - (x+ y - 5)dy = 0$.



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7. Solve the following differential equation

$$(x^2 + 1) \frac{dy}{dx} + 2xy = \sqrt{x^2 + 4}.$$



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8. Solve the following differential equation .

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



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9. Solve $\frac{dy}{dx} - y \cot x = xy^4$.



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10. Solve the following differential equations

$$\frac{dy}{dx} + 2y \tan x = \sin x, y\left(\frac{\pi}{3}\right) = 0$$



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11. Find the particular solution of the differential equation

$$(\tan^{-1} y - x) dy = (1 + y^2) dx, \text{ given that } x=$$

1, when $y=0$.



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12. Find the solution of the differential equation

$$x \sin\left(\frac{y}{x}\right) dy = \left(y \sin\left(\frac{y}{x}\right) - x\right) dx.$$



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Topic Test 2

1. Check whether the differential equation is homogeneous.

$$x \cos(y/x) dy = \left(y \cos \frac{y}{x} - x\right) dx.$$



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2. Check whether the differential equation

$$(4x - 5y - 7) \frac{dy}{dx} + 5x + 4y - 7 = 0 \quad \text{is}$$

reducible to homogeneous differential equation .



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3. Find the solution of differential equation

$$(2x - 3y - 5) \frac{dy}{dx} + (3x - 2y - 5) = 0.$$



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4. Find the solution of the following differential equations:

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



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5. Solve the differential equation.

$$x(x + y)dy = (x^2 + y^2)dx$$



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6. Find the solution of the following differential equations:

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



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7. Show that the given equation is homogeneous

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



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8. Find the solution of the following differential equations:

$$(4x+6y+5)dx-(2x+3y+4)dy=0$$



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9. If the homogeneous form of the differential equation

$$\frac{dy}{dx} = \frac{x + y + 1}{x - y + 1} \text{ is } \frac{dY}{dX} = \frac{X + Y}{X - Y}, \quad \text{then}$$

what is the relation between X and x?



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10. Find the integrating factor of differential equation

$$(x^2 - 1) \frac{dy}{dx} + 2xy = 1.$$



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11. Find the integrating factor of differential equation $\sin x \frac{dy}{dx} + 3y = \cos x$.



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12. Find the solution of $(x + \tan y)dy = \sin 2y dx$.



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13. Find integrating factor of differential equation

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



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14. Solve the following differential equations

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



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15. Find the solution of the differential

equation $\frac{dy}{dx} + P(x)y = 0$.



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16. Solve $\frac{dy}{dx} - 3y \cot x = \sin 2x$, when $y=2$
and $x = \frac{\pi}{2}$



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17. Find the solution of the differential
equation $\frac{dy}{dx} + \frac{y}{x-1} = xy^{1/2}$



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18. Find the transformed form of the Bernoulli's equation given by

$$\frac{dy}{dx} - y \tan x = \frac{\sin x \cos^2 x}{y^2}.$$



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19. Solve $x \frac{dy}{dx} + y = xy^2$.



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20. Solve $x \frac{dy}{dx} + y = x^3 y^6$.



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Chapter Test 1 Mark Questions

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

$$\left(\frac{dy}{dx}\right)^2 + \frac{d^3y}{dx^3} + 3xy = 0.$$



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2. What is the number of constants in the solution of the differential equation

$$\frac{d^3y}{dx^3} + x \cos x + e^{2x} = 0. ?$$



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3. Solve $\frac{dy}{dx} = \frac{x^2}{y^2}$.



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4. Form the differential equation of the family

of curve $y = \frac{x^2}{y^2}$.



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5. Write the differential equation of the system of straight line in cartesian plane with slope 3.



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6. Find the order and degree of each of the following differential equations, if defined.

$$\left(\frac{d^2y}{dx^2}\right)^3 + x\left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$$



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7. Form the differential equation of the family of curves $y = a \sin(x + b)$, where a and b are arbitrary constants.



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8. Write the order of the differential equation whose solution is given by

$$y = (c_1 + c_2)\cos(x + c_3) + c_4e^{x+c_5}$$

where c_1, c_2, c_3, c_4 and c_5 are arbitrary constants



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9. Verify that $y = e^{-x} + Ax + B$ is a solution

of the differential equation $e^x \left(\frac{d^2y}{dx^2} \right) = 1$.



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10. Solve $\frac{dy}{dx} = y^2 + 2y$.



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11. Find the differential equation corresponding to curve $x^2 + y^2 = a^2$, where a is constant.



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12. Find the integrating factor of y

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



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13. Find the integrating factor of the given

linear differential equation $\frac{dy}{dx} + 2y = 6e^x.$



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Chapter Test 4 Marks Questions

1. Form the differential equation for the family of the curves $y^2 = a(b - x)(b + x)$, where a and b are arbitrary constants.



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



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3. Solve each of the following differential equations :

$$(x + 1) \frac{dy}{dx} = 2e^{-y} - 1, y = 0 \text{ when } x=0.$$



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4. Solve $\frac{d^2y}{dx^2} = 2\sqrt{x} + 1.$



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5. Solve $\frac{d^2y}{dt^2} = e^{2t} + e^{-t}.$



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6. Find the solution of the following differential equations:

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



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7. Solve each of the following differential equations :

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



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8. Solve $\frac{dy}{dx} + 2y \tan x = \sin x$, if $y\left(\frac{\pi}{3}\right) = 0$.



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9. Solve the following differential equations.

$$\sin x \, dy/dx + 3y = \cos x$$



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1. Form the differential equation representing the family of curves $y^2 - 2ay + x^2 = a^2$, where a is an arbitrary constant.



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2. Solve $\sec x \frac{d^2y}{dx^2} = 1$.



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3. Solve $(x - y - 2)dx + (x - 2y - 3)dy = 0$

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4. find the solution of the differential equation

$$\frac{dx}{dy} = \frac{3x - 7y + 7}{3y - 7x - 3}$$



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5. solve $\frac{dy}{dx} = \frac{x + 2y + 3}{2x + 3y + 4}$



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6. solve the following differential equation

$$\left(1 + e^{\frac{\pi}{y}}\right) dx + e^{\frac{\pi}{y}} \left(1 - \frac{\pi}{y}\right) dy = 0.$$



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7. Solve the following differential equations

$$(1 - x^2) \frac{dy}{dx} + 2xy = x \sqrt{1 - x^2}$$



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8. $(x - 1)dy + ydx = x(x - 1)y^{1/3}dx.$



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