



# MATHS

# **BOOKS - ARIHANT PUBLICATION**

# **DIFFERENTIAL EQUATION**



1. Find the order and degree, if defined of each of the

following differential equation.

 $rac{dy}{dx} - \sec x = 0$ 

2. Find the order and degree, if defined of each of the

following differential equation.

$$y^{\prime}$$
'''  $+y^2+e^{y^{\prime}}=0$ 

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3. Find the order and degree, if defined of each of the

following differential equation.

$$y=xrac{dy}{dx}+\sqrt{1+\left(rac{dy}{dx}
ight)^2}$$

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**4.** Verify that the function  $y = e^{-3x}$  is a solution of the differential equation  $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$ 

5. Verify that  $y = A \cos x + B \sin x$  is a solution of the

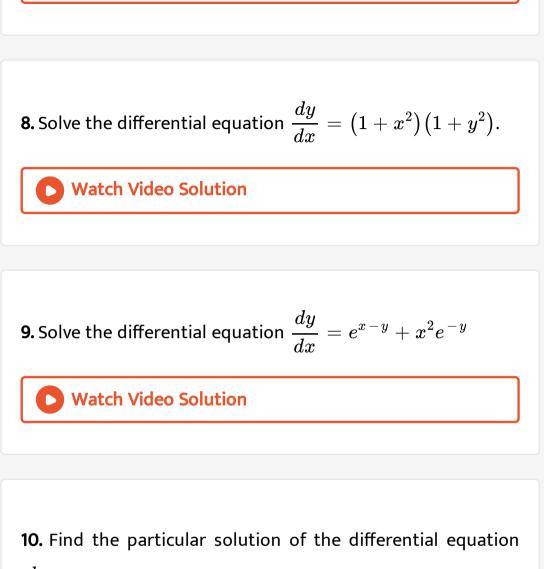
differential equation 
$$\displaystyle rac{d^2 y}{dx^2} + y = 0$$

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6. Verify that the function  $x + y = \tan^{-1} y$  is a solution of the differential equation  $y^2y' + y^2 + 1 = 0$ 

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7. Find the differential equation of the family of curves  $y = Ax + \frac{B}{x}$ , where A and B are arbitary constants.



$$rac{dy}{dx}=~-~4xy^2$$
, given that y= 1, when x= 0.

**11.** Find the particular solution of the following differential equation:  $\left(\frac{dy}{dx}\right) = \frac{1+y^2}{1+x^2}$  given that  $y = \sqrt{3}$  when x = 1

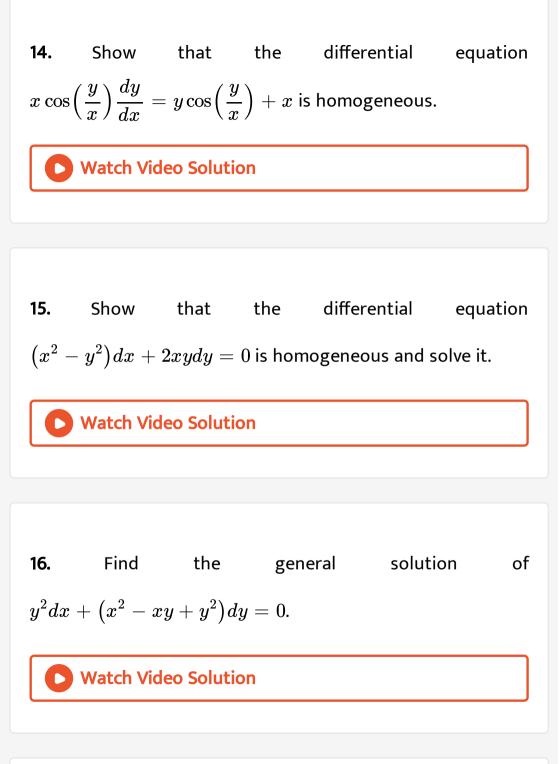
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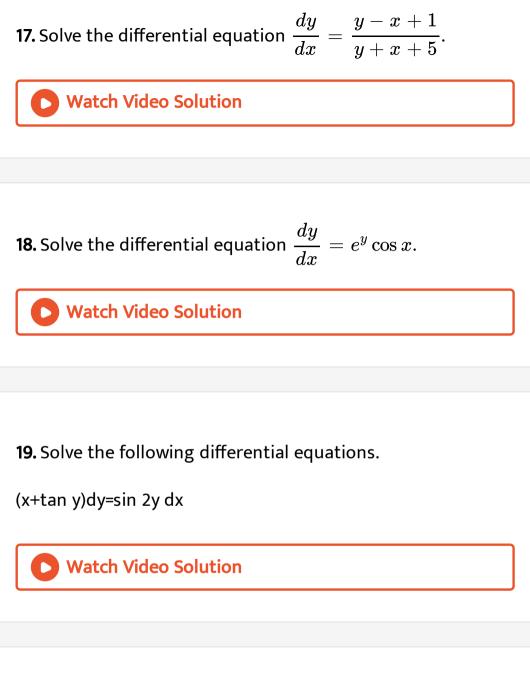
12. Solve 
$$rac{d^2y}{dx^2}=6x+2.$$

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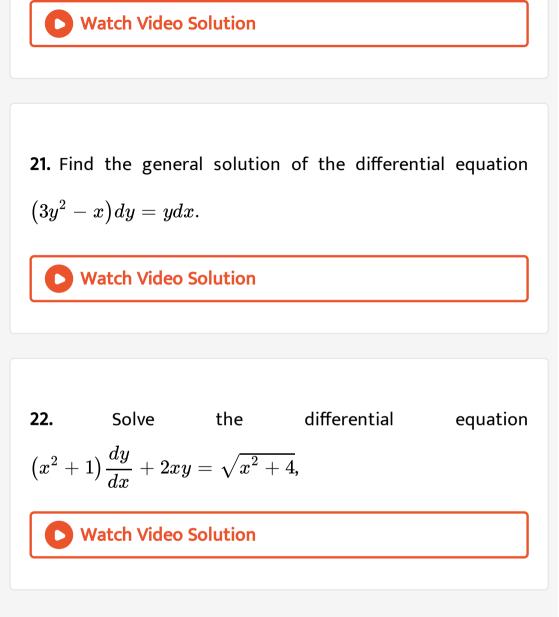
13. Solve the differential equation  $rac{dy}{dx}+1=e^{x+y}$ 







20. Find the general solution of the following differential equation  $e^{2x} \frac{dy}{dx} + 3e^{2x}y = 1$ 



Questions For Practice Of Part I Very Short Answer Type

1. Find the order and degree of each of the following

differential equations, if defined.

$$x igg( rac{d^3y}{dx^3} igg)^2 + igg( rac{dy}{dx} igg)^4 + y^2 = e^{-x}$$

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

$$\left(rac{d^2y}{dx^2}
ight)^2+5xigg(rac{dy}{dx}igg)^4-6y=\log x$$

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

$$xyiggl(rac{d^2y}{dx^2}iggr)^2+xiggl(rac{dy}{dx}iggr)-yiggl(rac{dy}{dx}iggr)=0$$

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

$$x\sqrt{1-y^2}dx+y\sqrt{1-x^2}dy=0$$

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

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

6. Find the order and degree of each of the following

differential equations, if defined.

$$\left(rac{d^2y}{dx^2}
ight)+\cos\!\left(rac{dy}{dx}
ight)=0$$

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

$$\log_e\!\left(1+rac{d^2y}{dx^2}
ight)=x.$$

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

$$\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = \frac{d^2y}{dx^2}.$$

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9. Write the order of the differential equation of the family of

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

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10. Write the order of the differential equation of the system

of ellipse 
$$rac{x^2}{a^2}+rac{y^2}{b^2}=1.$$

11. Write the degree of the differential equation

$$Inigg(rac{d^2y}{dx^2}igg)=y.$$

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**12.** Write the order of the differential equation whose general

solution is  $y = ax^2 + b$ , where a and b are arbitrary

constants.



**13.** Write the order and the degree of the following differential equation.

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



14. Write the order and degree of the differential equation

$$\left(rac{dy}{dx}
ight)^5 = rac{\left(rac{d^2y}{dx^2}
ight)^3}{1+rac{dy}{dx}}$$



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15. Determine the order and degree of the differential

equation 
$$rac{d^2y}{dx^2}=rac{2y^3+\left(rac{dy}{dx}
ight)^3}{\sqrt{rac{d^2y}{dx^2}}}$$



16. Write the order and degree of the differential equation

$$\left(rac{d^2y}{dx^2}+rac{dy}{dx}
ight)^5+\left(rac{d^3y}{dx^3}
ight)^2=x^4\sqrt{3rac{d^3y}{dx^3}+1}$$

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17. 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

18. 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

p = q

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**19.** 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

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20. Verify that the function  $y=\sqrt{a^2-x^2}, x\in(-a,a)$  is a solution of differential equation  $x+yrac{dy}{dx}=0(y
eq 0).$ 

**21.** Verify that  $y = e^{-x} + Ax + B$  is a solution of the differential equation  $e^x \left( \frac{d^2 y}{dx^2} \right) = 1.$ 

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22. Write the differential equation obtained by elimenating

the arbitrary constant C in the equation representing the

family of curves  $xy = C \cos x$ .

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23. Write the differential equation of the family of straight

lines parallel to the Y-axis.



24. Form the differential equation whose primitive is  $y = Ae^{3x} + Be^{-3x}$ .

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

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Questions For Practice Of Part I Short Answer Type

1. If 
$$f'(x) = e^x + \frac{1}{1+x^2}$$
 and  $f(0) = 1$ , then f(x).

.

2. Find the particular solution of the differential equation

 $rac{d^2y}{dx^2}=6x,$  given that  $y=1~~{
m and}~~rac{dy}{dx}=2$ , when x= 0 at Y-axis.



3. Find the differential equation whose general solution is

 $ax^2 + by = 1$ , where a and b are arbitrary constants.



**4.** Obtain the general solution of the following differential equations.

$$\frac{dy}{dt} = e^{2t+3y}$$
Solution
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5. Find the differential equation whose general solution is
 $y = a \cos x + b \sin x.$ 
Solution
Watch Video Solution

6. Find the differential equation whose general solution is

 $C_1x^2+C_2y^2=1$ , where  $C_1$  and  $C_2$  are arbitrary

constants.



7. Show that  $y=Ae^{mx}+Be^{nx}$  is a solution of the differential equation  $rac{d^2y}{dx^2}-(m+n)rac{dy}{dx}+mny=0.$ 

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**8.** Form the differential equation for the family of curves  $ay^2 = \left(x-c
ight)^3$ , where c is a parameter.

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

constants.



10. Form the differential equation having  $y = \left(\sin^{-1}x\right)^2 + A\cos^{-1}x + B$ , where A and B are

arbitrary constants, as its general solution.

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**Questions For Practice Of Part I Long Answer Type** 

1. Form the differential equation of the family of ellipse

having foci on Y-axis and centre at origin.



2. Form the differential equation of the family of all circles of

radius r.



# Questions For Practice Of Part Ii Very Short Answer Type

**1.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

$$rac{dy}{dx} - rac{x}{x^2+1} = 0$$

2. Solve the following differential equations (or find the general solution (or solution) of following differential equations)  $dy = x^2$ 

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



**3.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

$$rac{dy}{dx} = x^3 e^{-2y}$$

**4.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

$$rac{dy}{dx} = \sqrt{4-y^2}(-2 < y < 2)$$

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**5.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

$$rac{dy}{dx} = \sin^{-1}x.$$

6. Solve the following differential equations (or find the general solution (or solution) of following differential equations) $\frac{dy}{dx} = 1 - x + y - xy.$ 

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**7.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

$$x\sqrt{1-y^2}dx+y\sqrt{1-x^2}dy=0.$$

**8.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

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

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**9.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

$$ig(1+y^2ig) { ext{tan}}^{-1} x dx + 2y ig(1+x^2ig) dy = 0.$$

**10.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

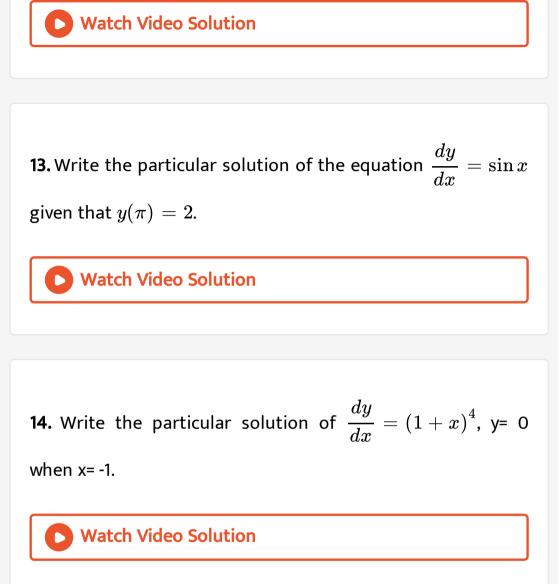
 $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0.$ 

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**11.** Solve the following differential equations (or find the general solution (or solution) of following differential equations)

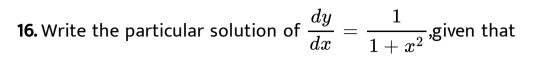
 $\cos x(1+\cos y)dx - \sin y(1+\sin x)dy = 0.$ 

12. Solve 
$$\displaystyle rac{dy}{dx} = y an x$$
 , when x= 0 and y= 1.



15. Form the differential equation , whose solution is

$$y = e^{x+a}$$



when x=0,y=1.

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17. Given the general solution as  $y=ig(x^2+cig)e^{-x}$  of a

differential equation, if y=0 when x= 1?

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Questions For Practice Of Part Ii Short Answer Type

1. Solve 
$$\displaystyle rac{dy}{dx} = \displaystyle rac{x^2+y^2}{xy}$$



2. Solve 
$$(x-1)rac{dy}{dx}=2x^3y$$
.

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3. Find the particular solution of the differential equation

$$e^x\sqrt{1-y^2}dx+rac{y}{x}dy=0$$
, given that y= 1, when x=0.

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**4.** Solve the initial value problem  $e^{rac{dy}{dx}}=x+1,$  y(0)=5.

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5. solve 
$$rac{dy}{dx} = \left(4x+y+1
ight)^2$$

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6. Find the particular solution of the differential equation

 $rac{dy}{dx} = 1 + x + y + xy$ , given that y=0, when x= 1.

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7. Find the particular solution of the differential equation

(x-y)(dx+dy)=dx-dy, given that y=-1, when x=0.

8. If y(x) is a solution of  $\left(\frac{2+\sin x}{1+y}\right)\frac{dy}{dx} = -\cos x$  and y(0)=1, then find the value of  $y\left(\frac{\pi}{2}\right)$ .



9. Find the equation of the curve passing through the point

 $\left(0, \frac{\pi}{4}\right)$ , whose differential equation is

 $\sin x \cos y dx + \cos x \sin y dy = 0.$ 



10. Find the particular solution of the differential equation

$$rac{dy}{dx} - rac{y}{x} + \cos ec \Big(rac{y}{x}\Big) = 0$$
, y= 0 when x=1.

11. Solve the following differential equation  

$$xy \log\left(\frac{y}{x}\right) dx + \left[y^2 - x^2 \log\left(\frac{y}{x}\right)\right] dy = 0.$$
  
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12. Solve the following differential equation 
$$x \cos\left(\frac{y}{x}\right) \frac{dy}{dx} = y \cos\left(\frac{y}{x}\right) + x, x \neq 0.$$

13. Solve the differential equation  

$$ye^{\frac{x}{y}}dx = \left(xe^{\frac{x}{y}} + y^2\right)dy(y \neq 0).$$

14. Solve 
$$rac{dy}{dx}=rac{y^2}{xy-x^2}.$$

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# Questions For Practice Of Part Ii Long Answer Type

1. Solve 
$$rac{d^2y}{dx^2} = \cos ec^2 x.$$

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2. Solve 
$$rac{d^2y}{dx^2}=9e^{-3x}$$

**3.** Solve 
$$rac{dy}{dx} = 4e^{2x} + \cos x + \sec^2 x$$
, given that  $y(0) = 2$ , .

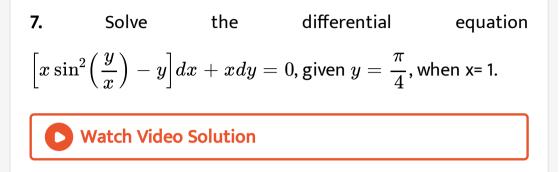


**4.** Solve 
$$rac{dy}{dt} = \cos^2(y).$$

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

6. Find the particular solution of the differential equation  $\frac{dy}{dx} = \frac{x+1}{\sin y + \cos y}$  given that  $y = \frac{\pi}{2}$ , when x= 1.

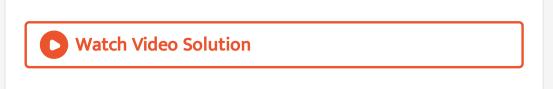


8. Find the solution of the differential equation  $\left\{x\cos\left(\frac{y}{x}\right) + y\sin\left(\frac{y}{x}\right)\right\}ydx = \left\{y\sin\left(\frac{y}{x}\right) - x\cos\left(\frac{y}{x}\right)\right\}xdy$ 

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9. Show that the differential equation  $2y \cdot e^{rac{x}{y}} dx + \Big(y - 2xe^{rac{x}{y}}\Big) dy = 0.$  Is homogeneous and find

its particular solution, given that x=0, when y= 1.



#### 10. Find the particular solution of the differential equation

$$rac{dy}{dx} = rac{xy}{x^2+y^2}$$
 given that y= 1, when x=0.

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11. Solve the differential equation  $x^2 dy + ig(xy + y^2ig) dx = 0$ 

given y=1, when x=1.



12. Find the general solution of differential equation  $\tan y dx + \cot x dy = 0.$ 

13. For the differential equation  $xy \frac{dy}{dx} = (x+2)(y+2)$ ,

find the solution curve passing through the point (1, -1).

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14. Show that the general solution of the differential

equation 
$$rac{dy}{dx}+rac{y^2+y+1}{x^2+x+1}=0$$
 is given by

(x+y+1)=A(1-x-y-2xy), where A is a parameter.

15. A population grows at the rate of 5% per year. How long

does it take for the population to double?



16. In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs 1000 is deposited with this bank, how much will it be worth after 10 yr?  $(e^{0.5} = 1.648)$ .

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Questions For Practice Of Part Iii Very Short Answer Type

1. Find the integrating factor of the differential equation

$$igg(rac{e^{-2\sqrt{x}}}{\sqrt{x}}-rac{y}{\sqrt{x}}igg)rac{dx}{dy}=1.$$

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2. Find the integrating factor of 
$$x \frac{dy}{dx} + 2y = x \cos x$$
.

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3. Write the integrating factor of the differential equation

$$\left(1+y^2
ight)+(2xy-\cot y)rac{dy}{dx}=0$$

**4.** Solve 
$$rac{dy}{dx}+rac{y}{2x}=3x^2$$

5. Solve 
$$rac{dy}{dx} + y = \cos x - \sin x$$

**6.** Solve 
$$rac{dy}{dx}+2xy=y$$



7. Solve 
$$rac{dy}{dx} - 2y = \cos 3x$$

**8.** Solve the differential equation  $x \frac{dy}{dx} + y = x^3$ , given that

y=1, when x= 2.

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9. Solve 
$$ydx + ig(x-y^3ig)dy = 0.$$

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**10.** Write an integrating factor of the differential equation

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



11. Find an integrating factor of the differential equation (x +

tan y ) dy = tan ydx.



12. Write an integrating factor of the differential equation

$$ig(1+y^2ig)dx=ig( an^{-1}y-xig)dy.$$

13. Write an integrating factor of the equation 
$$rac{dy}{dx} - rac{y}{x} = x^2 + 1$$



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

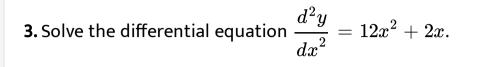
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Questions For Practice Of Part Iii Short Answer Type

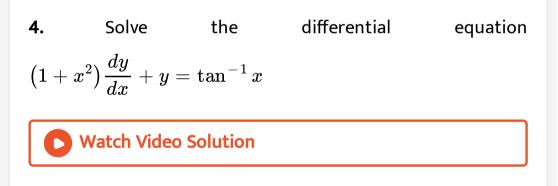
**1.** Find the integrating factor of the solution of the differential equation  $Iny \frac{dy}{dx} = -yIny$ .

2. Solve 
$$x rac{dy}{dx} - y = \log x$$





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5. Solve the differential equation  $ig(1+x^2ig)rac{dy}{dx}+y=e^{ an^{-1}x}$ 

**6.** Solve 
$$(1+x^2)rac{dy}{dx}+2xy=rac{1}{1+x^2}$$
 where y= 0 and x= 1.

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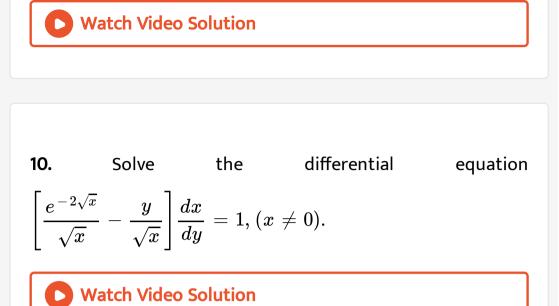
7. Solve 
$$ig(x^2+1ig)rac{dy}{dx}-2xy=ig(x^2+2ig)ig(x^2+1ig).$$

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8. Solve the differential equation 
$$(1+x^2)dy+2xydx=\sec^2xdx.$$

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



11. Solve the differential equation  $(y + 3x^2) \frac{dx}{dy} = x$ .

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Questions For Practice Of Part Iii Long Answer Type

1. Solve 
$$rac{dy}{dx} = xy^2$$



2. Solve 
$$rac{dy}{dx} = y \cot x.$$

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3. Find the particular solution of the differential equation

 $xrac{dy}{dx}+y-x+xy \operatorname{cot} x=0, x
eq 0$ , given that when  $x=rac{\pi}{2}, y=0.$ 

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

5. Solve the differential equation 
$$(x^2+1)\frac{dy}{dx}+2xy=\sqrt{x^2+4},$$

6. Find the general solution of the differential equation

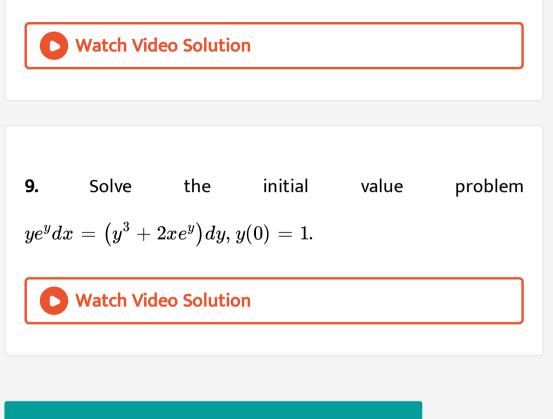
$$ig(1+y^2ig)rac{dx}{dy}+ig(x-e^{ an^{-1}y}ig)=0.$$

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**7.** Find the particular solution of the differential equation

 $( an^{-1} y - x) dy = ig(1+y^2ig) dx$ , given that x= 1, when y=0.

8. solve:
$$(x-\sin y)dy+(\tan y)dx=0$$



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1. Determine the order and degree of each of the following

differential equations.

 $y \sec^2 x dx + \tan x dy = 0$ 



2. Determine the order and degree of each of the following

differential equations.

$$\left(rac{dy}{dx}
ight)^4+y^5=rac{d^3y}{dx^2}$$

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3. Determine the order and degree of each of the following

differential equations.

$$arac{d^2}{dx^2}=\left\{1+\left(rac{dy}{dx}
ight)^2
ight\}^rac{3}{2}$$

4. Determine the order and degree of each of the following

differential equations.

$$an^{-1}\sqrt{rac{dy}{dx}}=x$$

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5. Determine the order and degree of each of the following

differential equations.

$$\ln\!\left(rac{d^2y}{dx^2}
ight)=y$$

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**6.** Determine the order and degree of each of the following differential equations.

$$\frac{\frac{dy}{dt}}{y + \frac{dy}{dt}} = \frac{yt}{\frac{dy}{dt}}$$

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7. Determine the order and degree of each of the following

differential equations.

$$rac{d^2y}{du^2} = rac{3y+rac{dy}{du}}{\sqrt{rac{d^2y}{du^2}}}$$



8. Determine the order and degree of each of the following

differential equations.

$$e^{rac{dy}{dx}}=x^2$$

9. Form the defferential equation by eliminating the arbitrary

constants in each of the following cases.

y = A sec x

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**10.** Form the defferential equation by eliminating the arbitrary constants in each of the following cases.

$$y = C \tan^{-1} x$$

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11. Form the defferential equation by eliminating the arbitrary

constants in each of the following cases.

$$y = Ae^t + Be^{2t}$$



12. Form the defferential equation by eliminating the arbitrary

constants in each of the following cases.

 $y = Ax^2 + Bx$ 

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13. Form the defferential equation by eliminating the arbitrary

constants in each of the following cases.

 $y = a \cos x + b \sin x$ 



**14.** Form the defferential equation by eliminating the arbitrary constants in each of the following cases.

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



15. Form the defferential equation by eliminating the arbitrary

constants in each of the following cases.

 $y = at + be^t$ 

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**16.** Form the defferentialequation by eliminating the arbitrary constants in each of the following cases.

 $y = a \sin t + b e^t$ 



17. Form the defferential equation by eliminating the arbitrary

constants in each of the following cases.

$$ax^2 + by = 1$$



18. Find the general solution of the following differential

equation.

$$rac{dy}{dx}=rac{e^{2x+1}}{e^x}$$

19. Find the general solution of the following differential

equation.

 $\frac{dy}{dx} = x\cos x$ 

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20. Find the general solution of the following differential

equation.

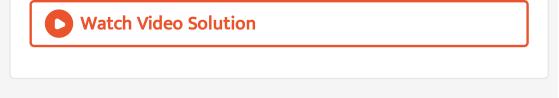
$$rac{dy}{dt} = t^5 \log t$$



**21.** Find the general solution of the following differential equation.

$$rac{dy}{dt} = 3t^2 + 4t + \sec^2 t$$

-



# 22. Find the general solution of the following differential

equation.

$$rac{dy}{dx}=rac{1}{x^2-7x+12}$$

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23. Find the general solution of the following differential

equation.

$$rac{dy}{du}=rac{u+1}{\sqrt{3u^2+6u+5}}$$

**24.** Find the general solution of the following differential equation.

$$ig(x^2+3x+2ig)dy-dx=0$$

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25. Find the general solution of the following differential

equation.

$$rac{dy}{dt}=rac{\sin^{-1}te^{\sin^{-1}}}{\sqrt{1-t^2}}$$

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**26.** Solve the following differential equations.

dy/dx=y+2

27. Solve the following differential equations.

$$rac{dy}{dt}=\sqrt{1-y^2}$$

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28. Solve the following differential equations.

$$rac{dy}{dz} = \sec y$$

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**29.** Solve the following differential equations.

$$rac{dy}{dx}=e^y$$

**30.** Solve the following differential equations.

$$rac{dy}{dx} = y^2 + 2y$$

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**31.** Solve the following differential equations.

$$dy + ig(y^2+1ig) dx = 0$$

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32. Solve the following differential equations.

`dy/dx+e^y/y=0



**33.** Solve the following differential equations.

dx+cot x dt=0



34. Obtain the general solution of the following differential

equations.

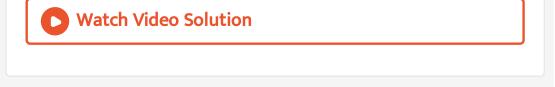
$${dy\over dx}ig(x^2+1ig)ig(y^2+1ig)$$

Watch Video Solution

**35.** Obtain the general solution of the following differential

equations.

$$rac{dy}{dt}=e^{2t+3y}$$



# 36. Obtain the general solution of the following differential

equations.

$$rac{dy}{dz} = rac{\sqrt{1-y^2}}{\sqrt{1-z^2}}$$

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# 37. Obtain the general solution of the following differential

equations.

 $rac{dy}{dx} = rac{x\log x}{3y^2+4y}$ 

38. Obtain the general solution of the following differential

equations.

$$x^2\sqrt{y^2+3}dx+y\sqrt{x^3+1}dy=0$$

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**39.** Obtain the general solution of the following differential equations.

`tan y dx+cot x dy=0

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**40.** Obtain the general solution of the following differential equations.

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



**41.** Obtain the general solution of the following differential equations.

 $ydy + e^{-y}x\sin xdx = 0$ 



42. Solve the following second order equation

$$rac{d^2y}{dx^2}=12x^2+2x$$

43. Solve the following second order equations

$$rac{d^2 y}{dt^2} = e^{2t} + e^{-1}$$

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44. Solve the following second order equation

$$rac{d^2 y}{d artheta^2} = \ -\sin artheta + \cos artheta + \sec^2 artheta \; .$$

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45. Solve the following second order equations

$$\cos ecx rac{d^2y}{dx^2} = x$$

46. Solve the following second order equation

$$x^2rac{d^2y}{dx^2}+2=0$$

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47. Solve the following second order equation

$$\sec x rac{d^2 y}{dx^2} = \sin 3x$$



48. Solve the following second order equations

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



**49.** solve: 
$$e^{-x} rac{d^2 y}{dx^2} = x$$

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50. Find the particular solutions of the following equations

subject to the conditions

 $\frac{dy}{dx} = \cos x$  given that y= 2 when x=0.

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51. Find the particular solutions of the following equations

subject to the conditions

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

52. Find the particular solutions of the following equations

subject to the conditions

$$rac{dy}{dx}=rac{1+y^2}{1+x^2}$$
, given that  $y=\sqrt{3}$  when x=0

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53. Find the particular solutions of the following equations

subject to the conditions

$$rac{d^2y}{dx^2}=6x,$$
 given that  $y=1~~{
m and}~~rac{dy}{dx}=2$  when x=0

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54. Solve : 
$$rac{dy}{dx} = \sec(x+y)$$

55. Solve : 
$$\frac{dy}{dx} = \sin(x+y) + \cos(x+y)$$

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56. Solve : 
$$rac{dy}{dx} = \cos(x+y)$$

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**57.** Solve the differential equation 
$$rac{dy}{dx} + 1 = e^{x+y}$$

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Odisha Bureau S Textbook Solutions Exercise 11 B

$$rac{dy}{dx} + y = e^{-x}$$

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2. Solve the following differential equations

$$ig(x^2-1ig)rac{dy}{dx}+2xy=1$$

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## 3. Solve the following differential equations

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

$$x\log xrac{dy}{dx}+y=2\log x$$

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## 5. Solve the following differential equations

$$ig(1+x^2ig)rac{dy}{dx}+2xy=\cos x$$



6. Solve the following differential equations.

dy/dx +y=sec x=tan x



 $(x+ an y)dy=\sin 2ydx$ 



8. Solve the following differential equations

$$ig(x+2y^3ig)rac{dy}{dx}=y$$

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9. Solve the following differential equations.

sin x dy/dx +3y=cos x



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

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11. Solve the following differential equations

$$ig(1+y^2ig)dx+\Big(x-e^{- an^{-1}y}\Big)dy=0$$

Watch Video Solution

### 12. Solve the following differential equations

$$xrac{dy}{dx}+y=xy^2$$



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

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14. Solve the following differential equations.

$$ig(1+x^2)rac{dy}{dx}=xy-y^2$$

Watch Video Solution

**15.** Solve the following differential equations.

$$rac{dy}{dx}+rac{y}{x-1}=xy^{rac{1}{2}}$$

$$rac{dy}{dx}+rac{y}{x}=x^2, y(1)=1$$

## Watch Video Solution

17. Solve the following differential equations

$$rac{dy}{dx}+2y an x=\sin x,y\Big(rac{\pi}{3}\Big)=0$$

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### Odisha Bureau S Textbook Solutions Exercise 11 C

1. Find the solutions of the following differential equations :

$$(x+y)dy+(x-y)dx=0$$

$$rac{dy}{dx} = rac{1}{2}igg(rac{y}{x}+rac{y^2}{x^2}igg)$$

Watch Video Solution

3. Find the solutions of the following differential equations :

$$ig(x^2+y^2ig)dx-2xydy=0$$

Watch Video Solution

4. Find the solution of the following differential equations:

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

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

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6. Find the solutions of the following differential equations :

$$y^2+x^2rac{dy}{dx}=xyrac{dy}{dx}$$

Watch Video Solution

7. Find the solutions of the following differential equations :

$$x\sinrac{y}{x}dy = \Big(y\sinrac{y}{x} - x\Big)dx$$

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

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**9.** Solve the differential equation 
$$rac{dy}{dx} = rac{y-x+1}{y+x+5}.$$

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**10.** Find the solutions of the following differential equations :

$$(x-1)dy = (y+1)dx$$

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



12. Find the solutions of the following differential equations :

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

Watch Video Solution

**13.** Find the solution of the following differential equations:

(2x+y+1)dx+(4x+2y-1)dy=0

(2x+3y-5)dy/dx+3x+2y-5-0

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15. Find the solution of the following differential equations:

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

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Chapter Practice Very Short Answer Type Questions

**1.** Find the order and degree of the following differential equations :

$$\left(rac{d^2y}{dx^2}
ight)^3+2\left(rac{dy}{dx}
ight)^4+6=\cos x$$

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2. Find the order and degree of the following differential

equations :

$$rac{d^4y}{dx^4}+\sin\!\left(rac{d^3y}{dx^3}
ight)=0$$

**3.** Find the order and degree of the following differential equations :

$$rac{d^2y}{dx^2} = \sqrt{1 + \left(rac{dy}{dx}
ight)^2}$$

4. Find the order and degree of the following differential

equations :

$$xrac{dy}{dx}+rac{2}{(dy/dx)}=y^2$$
 .

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5. Find the order and degree of the following differential

equations :

$$x^3igg(rac{d^2y}{dx^2}igg)^2+xigg(rac{dy}{dx}igg)^4=0$$



**6.** Find the order and degree of the following differential equations :

$$rac{d^2y}{dx^2} + \left[1 + \left(rac{dy}{dx}
ight)^3
ight]^{rac{5}{2}} = 0$$

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7. State whether  $y = e^{-x}(x+a)$  is a solution of differential

equation 
$$\displaystyle rac{dy}{dx} + y = e^{\,-\,x}$$

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8. Verify that the function  $y = a \cos x + b \sin x$ , where

 $a,b\in R$  is a solution of the differential equation $rac{d^2y}{dx^2}+y=0$ 

**9.** Show that the function  $y = (A + Bx)e^{3x}$  is a solution of

the equation 
$$\displaystyle rac{d^2y}{dx^2} - 6 \displaystyle rac{dy}{dx} + 9y = 0$$

### Watch Video Solution

10. Show that 
$$y=Cx+rac{a}{C}$$
 is a solution of differential equation  $y=xrac{dy}{dx}+rac{a}{rac{dy}{dx}}$ , where C is a parameter.

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11. Prove that  $xy = ae^x + be^{-x} + x^2$  is the general solution

of the differential equation
$$xrac{d^2y}{dx^2}+2rac{dy}{dx}-xy+x^2-2=0$$

12. Show that the function 
$$\phi$$
, defined by  $\phi(x)=\cos x(x\in R)$ , satisfies the initial value problem  $rac{d^2y}{dx^2}+y=0, y(0)=1, y'(0)=0.$ 

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13. Find the differential equation of the family of all straight

lines.



14. Write the differential equation of all non-horizontal lines

in a plane.



15. Write the differential equation representing the family of

curves y = mx, where m is an arbitrary constant.

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16. Find the differential equation of the family of concentric

circles having centre (0, 0).



**17.** Find the differential equation of the family of curves

 $y = Ae^x + Be^{-x}$ , where A and B are constants.

18. Form the differential equation by aliminating A and B in

$$Ax^2 + By^2 = 1$$

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**19.** Find the differential equation corresponding to curve  $y = a \cos(x + b)$ , where a and b are constants.



20. Solve the following differential equations :

$$rac{dy}{dx} = \sqrt{1-y^2}, \; -1 < y < 1$$

$$rac{dy}{dx} + y = 1, y 
eq 1.$$

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22. Solve the following differential equations :

$$rac{dy}{dx} - rac{y(x+1)}{x} = 0$$

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23. Solve the following differential equations :

$$rac{dy}{dx}=e^{x+y}+x^2e^y$$



24. Write the solution of differential equation  $\left(e^x+e^{-x}
ight)dy=\left(e^x-e^{-x}
ight)dx.$ 

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25. If 
$$rac{dy}{dx} = y e^x extrm{ and } x = 0, y = e$$
, then find the value of y,

when x= 1.

## Watch Video Solution

**26.** Solve 
$$2(y+3) - xy \frac{dy}{dx} = 0$$
, given that  $y(1) = -2$ .

27. Solve the differential equation  $\frac{dy}{dx} = y \sin 2x$ , given that y(0) = 1.Watch Video Solution **28.** Solve the initial value problem  $dy = e^{2x+y} dx, y(0) = 0.$ Watch Video Solution

**29.** Find the equation of a curve passing through the point (-2, 3), given that slope of the tangent to the curve at any point (x, y) is  $\frac{2x}{y^2}$ .

**30.** Show that the given differential equation is homogeneous ans solve it  $y' = rac{x+y}{x}$ .

31. Find the integrating factor of the differential equation

$$xrac{dy}{dx} - y = 2x^2.$$

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32. Find the integrating factor of the differential equation

$$ig(1-y^2ig)rac{dx}{dy} + yx = ay, \ -1 < y < 1.$$

**33.** Write the integrating factor of 
$$\frac{dy}{dx} - \frac{1}{(1+x)}y = (1+x)e^x$$
.

34. Write the integrating factor of the differential equation

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

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**35.** Find the general solution of 
$$rac{dy}{dx} + ay = e^{mx}$$

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Chapter Practice Short Answer Type Questions

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



2. Solve each of the following differential equations :

$$ig(1+y^2ig)(1+\log x)dx+xdy=0.$$



3. Solve each of the following differential equations :

$$rac{dy}{dx}+rac{1+\cos 2y}{1-\cos 2x}=0$$

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

### Watch Video Solution

5. Solve each of the following differential equations :

$$2xydx+ig(x^2+2y^2ig)dy=0.$$

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6. Solve each of the following differential equations :

$$ig(x^2-yx^2ig)dy+ig(y^2+x^2y^2ig)dx=0.$$

$$rac{dy}{dx} + 2y = 6e^x.$$

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8. Solve each of the following differential equations :

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

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9. Solve each of the following differential equations :

$$ig(1+x^2)rac{dy}{dx}-x=2 an^{-1}x.$$

$$ig(x+3y^2ig)rac{dy}{dx}=y(y>0)$$

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11. Solve each of the following differential equations :

$$xdy-ig(y+2x^2ig)dx=0.$$

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### Chapter Practice Long Answer Type Questions

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



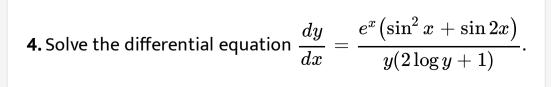
2. Form the differential equation of the family of circles in the

second quadrant, which touch the coordinate axes.

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**3.** Show that the differential equation represents the family of all parabolas having their axis of symmetry coincident with the axis of x is  $yy_2 + y_1^2 = 0$ .

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5. Solve the differential equation 
$$\frac{dy}{dx} = 1 + x + y^2 + xy^2$$
,

when y=0, x=0.

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**6.** Solve 
$$(x+y)^2 rac{dy}{dx} = a^2.$$

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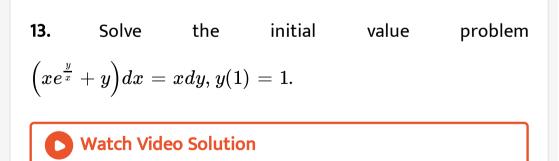
7. Show that the differential equation 
$$(x^2 + xy)dy = (x^2 + y^2)dx$$
 is homogeneous and solve it.

8. Solve 
$$x^2 \frac{dy}{dx} = x^2 + xy + y^2$$
.  
Watch Video Solution  
9. Show that the differential equation  
 $(x^2 - y^2)dx + 2xydy = 0$  is homogeneous and solve it.  
Watch Video Solution  
10. Solve the differential equation  
 $(1 + e^x)dx + (1 + e^y)dy = 0$ .  
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11. Find the particular solution of the differential equation  $2xy + y^2 - 2x^2 rac{dy}{dx} = 0, y = 2$  when x=1.

### Watch Video Solution

12. Solve 
$$x^2 rac{dy}{dx} - xy = x, x = 1, y = rac{\pi}{2}.$$



14. Show that the family of curves for which the slope of the tangent at any point (x, y) on it is  $\frac{x^2 + y^2}{2xy}$ , is given by  $x^2 - y^2 = Cx$ .

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15. Find the general solution of 
$$\displaystyle rac{dy}{dx} + 3y = \displaystyle rac{1}{e^{3x}}.$$

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16. Solve the differential equation  $x \frac{dy}{dx} - ay = x + 1$ .

17. Solve 
$$y + rac{d}{dx}(xy) = x(\sin x + \log x).$$

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18. Find the particular solution of the differential equation

$$rac{dy}{dx}-x=x^2$$
, given that y=2, when x=0.

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19. Find the particular solution of the differential equation

$$rac{dy}{dx} = (y+1)e^{-x}$$
, given that y= 0, when x= 1.

20. Find the equation of a curve passing through the origin

and satisfying the differential equation 
$$(1+x^2)\frac{dy}{dx}+2xy=4x^2$$

21. Find the particular solution of the differential equation

$$ig(1+x^2ig)rac{dy}{dx}=y$$
, given that y=1, when x=0.