

#### **MATHS**

## **BOOKS - RS AGGARWAL MATHS (HINGLISH)**

## **HOMOGENEOUS DIFFERENTIAL EQUATION**

#### **Solved Examples**

1. Show that the differential equation

$$2x^2 \frac{dy}{dx} - 2xy + y^0 = 0$$
 is homogeneous and solve it.



- **2.** Show that the differential equation  $\frac{dy}{dx} = \frac{y-x}{y+x}$  is homogenous and solve it.
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- **3.** Show that the differential equation is  $x \frac{dy}{dx} y = \sqrt{x^2 + y^2}$ , is homogenous and solve it.
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**4.** Show that the differential equation  $\left(x\sqrt{x^2+y^2-y^2}\right)dx+xydy=0$  is homogenous and solve it.

**5.** Show that the differential equation  $ig(x^2+xyig)dy=ig(x^2+y^2ig)dx$  is homogeneous and solve it.



**6.** Show that the differential equation  $y^2dx+ig(x^2-xy+y^2ig)dy=0$  is homogenous and solve it.



**7.** Show that the differential equation  $x^2 \frac{dy}{dx} = \left(x^2 - 2y^2 + xy\right)$  is homogenous and solve it.



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**8.** Solve the following differential equation:  $(x^3+y^3)dy-x^2ydx=0$ 



**9.** Show that the differential equation  $ig(y^2-x^2ig)dy=3xydx$  is homogenous and solve it

**10.** Show that the differential equation  $ig(x^3-3xy^2ig)dx=ig(y^3-3x^2yig)dy$  is homogenous and solve it.



11. Show that the differential equation  $\dfrac{(x-y)dy}{dx}=x+2y,$  is homogeneous and solve it.



that the differential equation **12**. Show  $x\frac{dy}{dx} = y - x \tan\left(\frac{y}{x}\right)$  is homogenous and solve it.



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Show that the differential equation: **13**.  $\Big(x\cos\Big(rac{y}{x}\Big)\Big)(ydx+xdy)=\Big(y\sin\Big(rac{y}{x}\Big)\Big)(xdy-ydx)$ 

is homogenous and solve it.



**14.** Show that the differential equation

$$-xy\log\Bigl(rac{y}{x}\Bigr)dx+\Bigl\{y^2-x^2\log\Bigl(rac{y}{x}\Bigr)\Bigr\}dy=0$$

is

homogeneous and solve it.



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15. Show that the differential equation  $x \frac{dy}{dx} \sin\left(\frac{y}{x}\right) + x - y \sin\left(\frac{y}{x}\right) = 0$  is homogenous.

the particular solution of this differential equation, given that x=1 when  $y=\frac{\pi}{2}$ .



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16. Find the particular solution of the differential equation

 $(3xy+y^2)dx+(x^2=xy)dy=0; f \,\, {
m or} \,\,\, x=1, \,\, y=1.$ 

**17.** Find the particular solution, satisfying the given condition, for the following differential equation:

$$rac{dy}{dx}-rac{y}{x}+\cos ec\left(rac{y}{x}
ight)=0;y=0$$
 when  $x=1$ 



**18.** The differential equations , find the particular solution satisfying the given condition:

$$\left[x\sin^2\left(rac{y}{x}
ight)-y
ight]dx+xdy=0;y=rac{\pi}{4}$$
 when x = 1



**19.** Find the equation of the family of curves for which the slope of tangent at any point (x,y) on it, is  $\frac{x^2 + y^2}{2xy}.$ 



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**20.** Show that the differential equation  $2ye^{\frac{x}{y}}\ dx + (y-2xe^{xy})\ dy = 0$  is homogeneous. Find the particular solution of this differential equation, given that x=0 when y=1.



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21. Show that the differential equation

$$\Big(1+e^{x\,/\,y}\Big)dx+e^{x\,/\,y}igg(1-rac{x}{y}igg)dy=0$$
 is



homogenous and solve it.

**22.** Show that the given differential equation is homogeneous and solve each of them.  $ydx + x\log\Bigl(\frac{y}{x}\Bigr)dy - 2xdy = 0$ 



 $\mathbf{1.} \, x dy = (x+y) dx$ 



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



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



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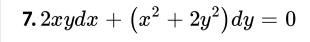
**4.** (x-y)dy - (x+y)dx = 0

**5.** Solve : 
$$(x+y)dy+(y-2x)dx=0$$



 $ig(x^2+3xy+y^2\ \hat{\ }\ ig)dx-x^2dy=0$ 

**6.** Solve the following differential equations:





8. 
$$\frac{dy}{dx} + \frac{x-2y}{2x-y} = 0$$



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- 9.  $rac{dy}{dx}=rac{2xy}{x^2-y^2}$ 
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- 10.  $rac{dy}{dx}=rac{x^2+y^2}{2xy}$ 
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11. 
$$rac{dy}{dx}=rac{2xy}{x^2-y^2}$$



**12.** Solve - 
$$x^2 rac{dy}{dx} = 2xy + y^2$$



13. 
$$x^2rac{dy}{dx}=x^2+xy+y^2$$

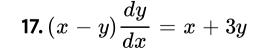


15. 
$$xrac{dy}{dx}-y=2\sqrt{y^2-x^2}$$



**16.** 
$$y^2 dx + (x^2 + xy + y^2) dy = 0$$







**18.** 
$$(x^3 + 3xy^2)dx + (y^3 + 3x^2y)dy = 0$$



# **19.** $\left(x-\sqrt{xy}\right)dy=ydx$



$$20. x^2 \frac{dy}{dx} + y^2 = xy$$



**22.** 
$$x \frac{dy}{dx} - y + x \sin\left(\frac{y}{x}\right) = 0$$



23. 
$$x \frac{dy}{dx} = y - x \cos^2\left(\frac{y}{x}\right)$$



**24.** 
$$\left(x\cos\left(\frac{y}{x}\right)\right)\frac{dy}{dx} = \left(y\cos\left(\frac{y}{x}\right)\right) + x$$



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

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



**26.** Find the particular solution of the differential equation  $\Big\{x\sin^2\Big(\frac{y}{x}\Big)-y\Big\}dx+xdy=0$ , it being given that  $y=\frac{\pi}{4}$  when x=1.



27. Find the particular solution of the differential equation  $\dfrac{dy}{dx}=\dfrac{y(2y-x)}{x(2y+x)}$ ,given that y=1 when x = 1.



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28. Find the particular solution of the differential equation  $\Big(xe^{y/x}+y\Big)dx=xdy$ , given that y(1)=0.



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29. Find the particular solution of the differential equation  $xe^{\frac{y}{x}}-y+x\frac{dy}{dx}=0,\,\,$  given that y(e)=0.

**30.** The slope of the tangent to a curve at any point (x,y) on its given by  $\frac{y}{x} - \frac{\cot y}{x} \frac{\cos y}{x}, (x>0,y>0)$  and the curve passes though the point  $(1,\pi/4)$ . Find the equation of the curve.



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