ORDINARY DIFFERENTIAL EQUATIONS

Equations of Order One and Degree One

TYPE-II: *Homogenous Equations and Reducible to Homogeneous Form*

Exercise Problems

These problems are meant to enhance your problem solving skills. They are given in 3 sets according to the level of difficulty. Try to do at least 4 problems per day on your own without referring to any resources. One component of your CIA will be based on the submission of these homework problems.

With best wishes,

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Level I

1. $x\frac{dy}{dx} = y + x\cos^2\left(\frac{y}{x}\right)$.
2. $\frac{dy}{dx} = \left(\frac{y}{x}\right)\left[1 + \log\left(\frac{y}{x}\right)\right]$.
3. $\frac{dy}{dx} = \left(\frac{y}{x}\right) + \tan\left(\frac{y}{x}\right)$.
4. $\frac{dy}{dx} - \sin\left(\frac{y}{x}\right) = (\frac{y}{x})$
5. $(x^2 + 2y^2)dx - xydy = 0$.
6. $y^2dx + x(x - y)dy = 0$.
7. $2xy^2dy - (x^3 + 2y^3)dx = 0$.

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

9. $2xy\frac{dy}{dx} = 3y^2 + x^2.$

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

11. $(x-8y+7)dx - (x-y)dy = 0.$

12. $(2y-x-1)dy - (2x-y+1)dx = 0.$

13. $\frac{dy}{dx} = \frac{x+y+4}{x-y-6}.$

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

15. $\frac{dy}{dx} = \frac{y-x+1}{y+x+5}.$

Level II

Solve the following:

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

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

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

4. $xdy - ydx = \sqrt{x^2+y^2dy}.$

5. $\left[xtan\left(\frac{y}{x}\right) - ysec^2\left(\frac{y}{x}\right)\right]dx + xsec^2\left(\frac{y}{x}\right)dy = 0.$

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

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

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

9. $(x^2 - 4xy - 2y^2)dx = (y^2 - 4xy - 2x^2)dy.$

10. $\frac{dy}{dx} + \frac{x^2+3y^2}{3x^2+y^2} = 0.$

11. $\left[xcos\left(\frac{y}{x}\right) + ysin\left(\frac{y}{x}\right)\right]y - \left[ysin\left(\frac{y}{x}\right) - xcos\left(\frac{y}{x}\right)\right]x\frac{dy}{dx} = 0.$

12. $x\frac{dy}{dx} = y[logy - logx + 1].$

13. $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}.$

14. $\frac{dy}{dx} = \frac{1+x+3y}{1-2x-y}.$

15. $\frac{dy}{dx} = \frac{x+y-2}{y-x-4}.$

Answers:

1. $x^2 + y^2 = c\,x^4.$

2. $xy^2(x + y) = c.$

3. $2x^2 - 2xy + y^2 = c.$

4. $\sinh^{-1}\left(\frac{y}{x}\right) = logx + c.$

5. $xtan\left(\frac{y}{x}\right) = c.$

6. $x + ye^{\frac{x}{y}} = c.$

7. –

8. $y - x = ce^{-\left(\frac{y}{x}\right)}$

9. $y^3 - 6xy^2 - 6x^2y + x^3 = c.$

10. $\frac{2xy}{(x+y)^2} = \log(\frac{c}{x+y})$

11. $cxy = \sec\left(\frac{y}{x}\right).$

12. $\log\left(\frac{y}{x}\right) = cx.$