The LNM Institute of Information Technology
Jaipur, Rajasthan
MATH-II # Assignment 5

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1. Find the order and degree of the following differential equations, where $y' = \frac{dy}{dx}$

   (i) $y'' + x^2y' = \sin y$ (ii) $(y')^{\frac{3}{2}} = 2x(ye^{-x^2} - y - 3x)$ (iii) $y''' + 2xy' + x^2 = \sqrt{y}\cos x$

2. Which of the following differential equations is/are linear

   (i) $y' + 2y = x^{\frac{2}{3}}$ (ii) $yy'' + 3y' = e^{3x^2}$ (iii) $y'' + 4y' = x\cos y$
   (iv) $x^2y'' + 4\sqrt{x}\ y = \cos x$ (v) $y'' + 4y^2 = 3x$ (vi) $y'' + 2x^2y' = \sqrt[3]{x}$

3. Solve (i) $\log(\frac{dy}{dx}) = 2x + 3y$ (ii) $\frac{dy}{dx} = e^{x+y} + x^2e^{x^3+y}$

4. Use the suitable transformation on the following differential equations to get separable equation form:

   (i) $\frac{dy}{dx} = (4x + y + 1)^2$ (ii) $(x + y)^2\frac{dy}{dx} = a^2$ (iii) $\frac{dy}{dx} = \sec(x + y)$

5. Solve the following homogeneous equations:

   (i) $x\cos\frac{y}{x}(y\ dx + x\ dy) = y\sin\frac{y}{x}(x\ dy - y\ dx)$ (ii) $x\frac{dy}{dx} = y(\log y - \log x + 1)$

6. Reducible to homogenous form

   (i) $\frac{dy}{dx} = \frac{(x+2y-3)}{2x+y-3}$ (ii) $\frac{dy}{dx} = \frac{(-x+y+2)}{x-2y-3}$

7. Show that the following equations are exact and hence find their general solution:

   (i) $\{y(1 + \frac{1}{x}) + \cos y\}dx + (x + \log\ x - x\sin\ y)dy = 0$ (ii) $xdx + ydy = \frac{ydx-xdy}{x^2+y^2}$.

8. Find the value of constant λ such that $\frac{dy}{dx} = -\frac{(3x^2+\lambda e^y)}{2xe^y+3y^2}$ is exact. Further, for the value of λ, solve the equation.

9. Find the integrating factor for the following differential equations

   (i) y(x + y) dx + (x + 2y - 1) dy = 0 (ii) y(x + y + 1) dx + x(x + 3y + 2) dy = 0

   Supplementary problems from "Advanced Engg. Maths. by E. Kreyszig (8^{th} Edn.)
   (i) Page 18, Q. 9,11,15,22,25
   (ii) Page 32, Q.10,17,26,29,34,35