

Department of Mathematics

Homework 1

Ordinary Differential Equations (Math 331)

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Instructor: Dr. Ala Talahmeh

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Question one: Solve the following ODE.

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


2. $\frac{dy}{dx} = \frac{xy+3x-y-3}{xy-2x+4y-8}, \quad y \neq 2, y \neq -3.$

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

4. $x^2(x-2)\frac{dy}{dx} + x(x-2)y = 2, \quad y(1) = 1.$

5. $(6x+1)y^2y' + 2y^3 + 3x^2 = 0.$

6. $y' = \tan^2(x+y).$ (Hint: Let $u = x+y$)

7. $(t^2+1)y' - 4t(y+\sqrt{y}) = 0.$ (Try by two methods!) 

8. $y' = 2 + \sqrt{y-2x+3}.$ (Hint: Let $u = y-2x+3$)

9. $(x \sin y + \cos y)y' + (x+y) \sin y = 0.$

10. $\frac{1}{z} \frac{dz}{dx} + \frac{1}{x} \ln z = 3x.$ (Hint: Let $u = \ln z$)

11. $(x^2+1)y' + 3x^3y = 6xe^{-\frac{3}{2}x^2}, \quad y(0) = 1.$

12. $x(x^2+4) \ln y y' = 12y^{-2}.$

Question Two: An object with temperature $108^\circ F$ was placed outside where the temperature is $-20^\circ F$. At $00 : 00$ the temperature of the object is $60^\circ F$ and at $00 : 02$ the temperature of the object is $30^\circ F$. At what time was the object placed outside?

Good Luck