

Tutorial: 03

Subject Code: 3110015

Year: 2018 - 2019

First Order ODE - Exact Equation

- 1 The student is supposed to complete the assignment and get it assessed by concerned faculty, after which the work has to be submitted in scan - pdf form to the concern faculty within the stipulated time.
- 2 This tutorial to be submitted on or before prescribed date in google classroom.
- 3 This tutorial carries maximum 10 marks.
- 4 Those who failed to submit during prescribed time limit, will be given zero.
- 5 This marks will be computed through cumulative scores in PA(M).
- 6 Reference Book: Advanced Engineering Mathematics by Erwin Kreyszig.

1. Show that the equation $-yx^{-2}dx + x^{-1}dy = 0$ is an exact and find the solution.
2. Show that the equation $e^{3\theta} (dr + 3rd\theta) = 0$ is an exact and find the solution.
3. Show that the equation $(\cot y + x^2) dx = x \operatorname{cosec}^2 y dy$ is an exact and find the solution.
4. Is the equation $3y^2 dx + x dy = 0$ exact? If possible find the solution with initial condition $y(1) = 1/2$?
5. Solve following exact differential equation.

$$(1) (x + \sin y)dx + (x \cos y - 2y)dy = 0.$$

$$(2) \quad 2xydx + (1 + x^2)dy = 0.$$

$$(3) \quad (y^2e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0.$$

$$(4) \quad ye^x dx + (2y + e^x)dy = 0, \quad y(0) = -1.$$

$$(5) \quad xdx + ydy = \frac{xdy - ydx}{x^2 + y^2}.$$

6. Is the equation $2xydy = (x^2 + y^2) dx$ exact? If possible find the solution with initial condition $y(1) = 2$?
7. Show that e^x is an integrating factor of $\sin ydx + \cos ydy = 0$ and solve the equation.
8. Show that $x^a y^b$ is an integrating factor of $(a + 1)ydx + (b + 1)xdy = 0$ and solve the equation.
9. Find an integrating factor and solve the equation $2xydx + 3x^2dy = 0$.
10. Find an integrating factor and solve the equation $(2 \cos y + 4x^2)dx = x \sin ydy$.
11. Find an integrating factor and solve the equation $2x \tan ydx + \sec^2 ydy = 0$.
12. Solve $(x^3 + 3xy^2)dx + (3x^2y + y^3)dy = 0$.
13. Solve
$$\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0.$$
14. Solve $[(x + 1)e^x - e^y] dx - xe^y dy = 0, \quad y(1) = 0$.