

Math 3331- HW2

1. Solve the following ODEs (linear)

$$(i) \quad xy' = 4y + x^4e^x$$

$$(ii) \quad (x+1)\frac{dy}{dx} + y = \ln x, \quad y(1) = 10$$

$$(iii) \quad x\frac{dy}{dx} + 2y = 6x^3 + 2$$

$$(iv) \quad \frac{dy}{dx} + \tan x y = \cos^2 x, \quad y(0) = -1$$

2. Solve the following ODEs (Bernoulli)

$$(i) \quad x\frac{dy}{dx} + y = x^2y^2$$

$$(ii) \quad x^2y' - 2xy = 5y^4, \quad y(1) = \frac{1}{2}$$

$$(iii) \quad x\frac{dy}{dx} + y = \frac{4x}{y^2}$$

$$(iv) \quad y^3\frac{dy}{dx} + \frac{y^4}{2x} = x, \quad y(1) = 2$$

3. Solve the following ODEs (Riccati)

$$(i) \quad \frac{dy}{dx} = y^2 - \frac{y}{x} - \frac{1}{x^2}, \quad y_1 = \frac{k}{x}$$

$$(ii) \quad y' = \frac{y^2 + 2\cos^2 x - \sin^2 x}{2\cos x}, \quad y_1 = \sin x$$

$$(iii) \quad \frac{dy}{dx} + 2x(y-1) = 2x^3(y-1), \quad y_1 = 1$$

$$(iv) \quad y' + y^2 = x^2 + 1, \quad y_1 = x$$

4. Solve the following ODEs (homogeneous)

$$(i) \quad \frac{dy}{dx} = \left(\frac{2x+y}{2x}\right)^2$$

$$(ii) \quad y' = \frac{y}{x} \ln \frac{y}{x} + 2\frac{y}{x}, \quad y(1) = 1$$

$$(iii) \quad 3xy^2y' = x^3 + 4y^3$$

$$(iv) \quad \frac{dy}{dx} = \frac{y + \sqrt{x^2 + y^2}}{x}, \quad y(1) = 0$$

Due: Friday Feb. 9, 2018