

HOMEWORK 3

1. Find the general solution to the following ODEs

$$\frac{dy}{dx} = \frac{x - e^{-x}}{y + e^y}$$
$$xy' = \sqrt{9 - y^2}$$

2. Find the solution to the following IVPs

$$y' = (1 - 2x)y^2, y(0) = -1/6$$
$$y' = \frac{x(x^2 + 1)}{4y^3}, y(0) = -1/\sqrt{2}$$

3. Find the interval of existence for the following IVPs

$$y' + \frac{t^4}{(t-2)^8}y = \sqrt{t}, y(1) = 8$$
$$(1 - t^4)y' + (\ln t)y = \cot 2t, y(2) = 0$$

4. Find the region of (x_0, y_0) in the xy -plane such that the following IVP is guaranteed to have at least a local solution

$$y' = \frac{1}{1 + 2y - 3t}, y(x_0) = y_0$$
$$y' = \sqrt{y + t}, y(x_0) = y_0$$