A3 Sample Midterm Test

1. Solve the following initial value problem

$$y' - \frac{1}{x}y = xe^{2x}, \quad y(1) = 0\,!$$

2. Find the equilibrium solutions of the autonomous differential equation

$$y' = (2 - y)y(y + 1)$$

and characterize them from the point of view of stability.

3. Use the method of undetermined coefficients to give the general solution of the following differential equation!

$$y'' - 4y' - 5y = e^{2x}$$

4. Consider the following inhomogeneous second order DE

$$y'' + 4y = \frac{8}{\cos 2t}.$$

A fundamental solution pair for the homogeneous equation is $y_1(t) = \sin 2t$ and $y_2(t) = \cos 2t$. Use the variation of parameter method to give a particular solution of the inhomogeneous DE!