

HOMWORK 12

0. Problem 3, 4, 5 in HW 11.

1. Find the general solution to the following ODEs

(a) $2x^2y'' - 4xy' + 6y = 0$

(b) $x^2y'' - 5xy' + 9y = 0$

(c) $(x + 1)^2y'' + 3(x + 1)y' + 0.75y = 0$

2. Find the solution to the following IVPs

(a) $2x^2y'' + xy' - 3y = 0, y(1) = 1, y'(1) = 4$

(b) $4x^2y'' + 8xy' + 17y = 0, y(1) = 2, y'(1) = -3$

3. (Bonus) Prove that if the characteristic roots of a second order linear homogeneous ODE are real, then the solution passes through the equilibrium at most once. Use this fact to argue that in the critically damped case or in the overdamped case, the mass will pass through the equilibrium at most once.