

EDDE. PROBLEM SET 5

1. Solve (i.e. find all solutions) the differential equation

$$y'' + \frac{y'}{x} - \frac{y}{x^2} = 0$$

knowing that one of its solutions is  $y(x) = x$ .

2. Using the same approach solve the differential equation

$$y'' + \frac{y'}{x} - \frac{y}{x^2} = \cos x.$$

3. Consider the differential equation  $y^{(3)} + y = y'' + y'$ . Observe that  $y(x) = e^x$  is one of its solutions. Substitute  $z(x) = e^{-x} \cdot y(x)$  and solve the resulting differential equation. Compare the two corresponding characteristic equations and their sets of roots.

4. Solve the differential equations:

a)  $y'' - 3y' + 2y = 0$ ;

b)  $y'' - 2y' + 2y = 0$ ;

c)  $y'' - 2y' + y = 0$ ;

d)  $y^{(3)} - 3y'' + 2y' = 0$ ;

e)  $y^{(3)} - 2y'' + 2y' = 0$ ;

e)  $y^{(3)} - 2y'' + y' = 0$ .