

Recitation 3: Second (Non-homogeneous) Order ODE

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Exercise 1. Find the general solution of the given differential equation.

1. $y'' - 2y' + y = 0$;

2. $9y'' + 6y' + y = 0$.

Exercise 2. Consider the initial value problem

$$y'' - y' + \frac{1}{4}y = 0, \quad y(0) = 2, \quad y'(0) = b.$$

Find the solution as a function of b , and then determine the critical value of b that separates solutions that remain positive for all $t > 0$ from those that eventually become negative.

Exercise 3. Use the method of variation of parameters to find a particular solution of the given differential equation

1. $y'' - 5y' + 6y = 2e^t$;

2. $y'' + 2y' + y = 3e^{-t}$.

Exercise 4. Use the method of undetermined coefficients to find the general solution of the given differential equation

1. $y'' + 2y' + 5y = 3\sin(2t)$;

2. $y'' - 2y' - 3y = -3te^{-t}$.

Exercise 5. Find the general solution of the given differential equation

$$y'' + 4y' + 4y = t^{-2}e^{-2t}, \quad t > 0.$$