Midterm 2

Practice exam MATH 222, Apr 2025

1. Find the solution of the differential equation

$$y'' + 7y' + 12y = 0, \quad y(0) = 2, \quad y'(0) = -7.$$

Describe the behavior of the solution for $t \to \infty$.

2. Compute a particular solution of the differential equation

$$y'' + 2y' + 5y = \cos(2t),$$

using the method of undetermined coefficients. For the same differential equation solve then the initial value problem $y(0) = \frac{4}{17}$ and $y'(0) = \frac{36}{17}$.

3. Solve the initial value problems and describe the behavior of solutions for $t \to \infty$

$$\mathbf{X}' = \begin{pmatrix} 3 & -5 \\ 1 & -1 \end{pmatrix} \mathbf{X} \qquad \mathbf{X}(0) = \begin{pmatrix} 1 \\ -1 \end{pmatrix}.$$

4. Use the method of variation of parameters to compute the general solutions of the differential equation

$$y'' + 4y = \csc(2t) \quad y(0) = 0.$$