

Math 305 Spring 2011

Assignment 3

The due date for this assignment is Wednesday, February 23.

Instructions: Feel free to use a computer to aid with otherwise tedious computations and plotting. In these cases, provide a printout for full credit. Additionally, be sure to demonstrate your knowledge of and competence with the techniques discussed in class, for full credit.

Problem 1 Section 4.1, #18

Problem 2 Section 4.3, #6

Problem 3 Section 4.3, #20

Problem 4 Section 4.3, #26

Problem 5 Section 4.3, #34

In problems 6 and 7, consider the following differential equation.

$$y''(t) - 2y'(t) + y(t) = 0.$$

Problem 6 Given $y(0) = 3$ only, find the general solution to the IVP.

Problem 7 Given $y(0) = 3$, find the solutions to the IVPs where $y'(0) = -3$, $y'(0) = 0$, and $y'(0) = 3$. Plot these solutions on the same graph, with domain $t \in [-1, 2]$.

Problem 8 Consider the IVP

$$y''(t) + ay'(t) + by(t) = 0, \quad y(0) = y_0 > 0, \quad y'(0) = y_1 > 0.$$

1. If $b > 0$ and $a = 0$, determine the corresponding solution.
2. If $a > 0$ and $b = 0$, show that the corresponding solution approaches a constant that depends on the initial conditions as $t \rightarrow \infty$. Determine this constant.

Problem 9 Find a function $y(t)$ such that $y^{(4)} = y^{(3)}$ for all t and $y(0) = 16$, $y'(0) = 12$, $y''(0) = 13$, and $y^{(3)}(0) = 7$.

Problem 10 Sometimes solutions to differential equations are written in terms of hyperbolic trigonometric functions. Find a linear, homogeneous, constant-coefficient equation with the following general solution.

$$y(t) = c_1 \cos(3t) + c_2 \sin(3t) + c_3 \cosh(3t) + c_4 \sinh(3t)$$