

Homework Assignment 9 in Differential Equations, MATH308-SPRING 2015

due March 9, 2015

Topics covered : *laplace transform: how to pass from initial value problems for a differential equation to an algebraic equation; inverse Laplace transform of rational functions using partial fraction decomposition; solution of initial value problems using Laplace transform; (corresponds to sections 6.1 and beginning of section 6.2)*

1. Solve for $Y(s)$, the Laplace transform of the solution $y(t)$ to the given initial value problem (you do not need to find the solution $y(t)$ itself here):

(a) $2y'' + 7y' + 6y = e^{5t} \sin 3t, \quad y(0) = 1, y'(0) = -1;$

(b) $2y'' + 3y' - 5y = t^2 e^t, \quad y(0) = 0, y'(0) = 1$

2. Find the inverse Laplace transform of the given function:

(a) $F(s) = \frac{2s + 5}{(s^2 - 2s - 15)(s + 3)}$

(b) $F(s) = \frac{3s + 1}{(s^2 - 4s + 53)(s - 1)}$

3. Using the method of Laplace transform solve the following initial value problem:

$$y'' + 2y' - 15y = 3e^{-2t} \cos 3t, \quad y(0) = 1, y'(0) = -1.$$