Math 231.04, Problem Set 11

Due Wednesday, April 7, 2010

From Text *Fundamentals of Differential Equations*, by Nagle, Saff, and Snider

Section 7.3, # 5, 25, 29
Section 7.4, # 1, 3, 5, 7, 21, 23, 25
Section 7.5, # 1, 3

Additional Problems:

1.) Let \( f(t) = t^2 \sin 6t + t \cos t \). Calculate \( \mathcal{L}(f) \), the Laplace transform of \( f \).

2.) Find \( \mathcal{L}^{-1} \left( \frac{s + 12}{s^2 - s - 6} \right) \), where \( \mathcal{L}^{-1} \) is the inverse Laplace transform.

3.) Find \( \mathcal{L}^{-1} \left( \frac{5s^2 + 2s + 8}{s^3 - s^2 + 4s - 4} \right) \), where \( \mathcal{L}^{-1} \) is the inverse Laplace transform.

4.) Find \( \mathcal{L}^{-1} \left( \frac{5s^2 - 2s + 30}{s^3 - 2s^2 + 10s} \right) \), where \( \mathcal{L}^{-1} \) is the inverse Laplace transform.

5.) Solve the initial value problem

\[ y'' - 7y' + 10y = 0, \quad y(0) = 1, \quad y'(0) = -4 \]

by the method of the Laplace transform. That means: take the Laplace transform of both sides of the equation, solve the result for \( Y = \mathcal{L}(y) \), and apply the inverse Laplace transform to find \( y \).

6.) Solve the initial value problem

\[ y'' - 4y = 16t, \quad y(0) = 0, \quad y'(0) = 0 \]

by the method of the Laplace transform (see problem 5 for a description of the method).