

Homework Assignment 11 in Differential Equations, MATH308-SUMMER

due June 27, 2012

Topics covered : *definition and properties of Laplace transform; some properties of Laplace transform: translation in s property, Laplace transform of the derivative, and derivative of Laplace transform; how, using Laplace transform, to pass from initial value problems for a differential equation to an algebraic equation (corresponds to sections 6.1 and beginning of section 6.2)*

1. Recall that the hyperbolic cosine $\cosh t$ and hyperbolic sine $\sinh t$ are defined as follows:

$$\cosh t = \frac{e^t + e^{-t}}{2}, \quad \sinh t = \frac{e^t - e^{-t}}{2}.$$

Find the Laplace transform of the given function (below a and b are real constants):

- (a) $f(t) = \cosh bt$;
 - (b) $f(t) = e^{at} \sinh bt$.
2. 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) $y'' - 5y' + 4y = e^{-3t} \sin 4t$, $y(0) = 0$, $y'(0) = -1$;
 - (b) $y'' + 4y' + 5y = t^4$, $y(0) = 1$, $y'(0) = 0$