

SS2065: INTRO TO PDES

Summer School, 2012

Assignment 2: to be handed to your tutor during the tutorial on Friday 20th January

1. Using the Table of Laplace transforms, or otherwise, find:

(a) $\mathcal{L}\{4t^3e^{-3t}\}$

(b) $\mathcal{L}\{\cos^2(4t)\}$

(c) $\mathcal{L}^{-1}\left\{\frac{3}{(s+2)^3}\right\}$

(d) $\mathcal{L}^{-1}\left\{\frac{15s}{s^2+4s+29}\right\}$

2. Use Laplace transforms to solve the DE

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = e^{-2t}$$

subject to the initial conditions $y(0) = 1$, $\frac{dy}{dt}(0) = -3$.

3. The current $i(t)$ in an electric circuit satisfies the DE

$$3\frac{di}{dt} + 6i = e(t)$$

where $e(t)$ is the applied potential. Initially, $i = 0$. Use Laplace transforms to find $i(t)$ for the cases

(a) $e(t) = 24$

(b) $e(t) = 9e^{-t}$

In each case, sketch the current $i(t)$ as a function of t .