MATH045/EE020A ODE HW week#9

Instructor: Heyrim Cho
Due June. 03, 2022

Use the Laplace transform to solve the initial value problems.

1. $y'' + y' - 2y = -4, \quad y(0) = 2,\ y'(0) = 3.$
2. $y'' + 3y' + 2y = e^t, \quad y(0) = 0,\ y'(0) = 1.$
3. $y'' + y = \sin(2t), \quad y(0) = 0,\ y'(0) = 1.$

Express the given function f in terms of unit step functions and find the Laplace transform. Use change of variables. Do not use Theorem 8.4.1.

4. $f(t) = \begin{cases} t^2 + 2, & 0 \le t < 1, \\ t, & 1 \le t. \end{cases}$
5. $f(t) = \begin{cases} e^{-2t}, & 0 \le t < 2, \\ e^{3t}, & 2 \le t. \end{cases}$
6. $f(t) = \begin{cases} 2\sin(t), & 0 \le t < \pi, \\ \cos(t), & \pi \le t. \end{cases}$
7. $f(t) = \begin{cases} 3, & 0 \le t < 2, \\ -3t + 2, & 2 \le t < 4, \\ -4t, & 4 \le t. \end{cases}$

Remark. $\sin(A + B) = \sin(A)\cos(B) + \cos(A)\sin(B), \quad \cos(A + B) = \cos(A)\cos(B) - \sin(A)\sin(B)$