

Note: This worksheet is too long to be completed during recitation.

1. Using the method of Laplace transforms, solve the following IVPs.

a. $y'' + 3y' + 2y = t, \quad y(0) = 1, \quad y'(0) = 0$

b. $y^{(4)} - 9y = 0, \quad y(0) = 1, \quad y'(0) = 0, \quad y''(0) = -3, \quad y'''(0) = 0$

c. $\mathbf{y}' = \begin{pmatrix} -5 & 1 \\ -9 & 5 \end{pmatrix} \mathbf{y}, \quad \mathbf{y}(0) = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

d. $\begin{cases} x'' - y'' + x - 4y = 0 \\ x' + y' = \cos t \end{cases} \quad x(0) = 0, \quad x'(0) = 1, \quad y(0) = 0, \quad y'(0) = 2$

2. Find the Laplace transform:

a. $f(t) = \begin{cases} 0, & t < 3 \\ t^2 - 6t + 18, & t \geq 3 \end{cases}$

3. Find the inverse Laplace transform:

a. $F(s) = \frac{(s-2)e^{-s}}{s^2 - 4s + 3}$