

Section 8.2 — Problem A

20 Points

Solve the following IVP using the Laplace transform:

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

Section 8.3 — Problem B

10 Points

Express the given function f in terms of the unit step functions.

$$\begin{aligned} 1) \quad f(t) &= \begin{cases} t & , 0 \leq t < 1 \\ 1 & , t \geq 1. \end{cases} \\ 2) \quad f(t) &= \begin{cases} t^2 & , 0 \leq t < 1 \\ \sin(t) & , t \geq 1. \end{cases} \end{aligned}$$

Section 8.3 — Problem C

10 Points

Find the Laplace transform of the given function.

$$\begin{aligned} 1) \quad f(t) &= \begin{cases} te^t & , 0 \leq t < 1 \\ e^t & , t \geq 1. \end{cases} \\ 2) \quad f(t) &= \begin{cases} 3 & , 0 \leq t < 2 \\ 3t + 2 & , 2 \leq t < 4 \\ 4t & , t \geq 4. \end{cases} \end{aligned}$$

Section 8.3 — Problem D

10 Points

Find the inverse Laplace transform of the given function.

$$\begin{aligned} 1) \quad H(s) &= \frac{e^{-s}}{s^3} + \frac{e^{-2s}}{s^2}. \\ 2) \quad H(s) &= \frac{5}{s} - \frac{1}{s^2} + e^{-3s} \left(\frac{6}{s} + \frac{7}{s^2} \right) + \frac{3e^{-6s}}{s^3}. \end{aligned}$$

TOTAL (POINTS): 50.