Homework 5

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Problem 1
Statement:
Find the laplace transform of:

$$f(t) = \begin{cases} 0, & t < 0 \\ te^{-3t}, & t \geq 0 \end{cases}$$

Solution

Problem 2
Statement:
Find the laplace transform of:

$$f(t) = \begin{cases} 0, & t < 0 \\ \sin(\omega t + \theta), & t \geq 0 \end{cases}$$

Solution

Problem 3
Statement:
Given:

$$F(s) = \frac{2(s+2)}{s(s+1)(s+3)}$$

use the Initial Value theorem to determine $f(0)$

Solution

Problem 4
Statement:
Given

$$F(s) = \frac{5(s+2)}{s(s+1)(s+3)}$$

use the Final Value theorem to determine $f(\infty)$

Solution

Problem 5
Statement:
Find the inverse laplace transform of:

$$F(s) = \frac{s+3}{(s+1)(s+2)}$$

Solution

Problem 6
Statement:
Find the inverse laplace transform of:

$$F(s) = \frac{1}{s(s^2 + 2s + 2)}$$

Solution

Problem 7
Statement:
A LTI system is described by:

$$\dot{x} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} x + \begin{pmatrix} 1 \\ 0 \end{pmatrix} u$$
$$y = \begin{pmatrix} 1 & 2 \end{pmatrix} x$$

Find the transfer function of the system.

Solution

Problem 8
Statement:
Find a state space realization of the transfer function:

$$G(s) = \frac{s^3}{s^3 + 3s^2 + 2s + 1}$$

Solution