Problem 1.
Find the inverse Laplace transform:

(a) \( \frac{s + 13}{s(s^2 + 4s + 13)} \)  
(b) \( \frac{s + 1}{(s + 2)(s^2 + 2s + 5)} \)  
(c) \( \frac{s^2 + 4s + 5}{(s + 3)(s^2 + 2s + 2)} \)  
(d) \( \frac{10s}{(s^2 + 1)(s^2 + 4)} \)

Problem 2.
Let
\[ F(s) = \frac{5(s + 1)}{(s + 2)(s + 3)} \]
(a) Use the initial and final value theorems to find \( f(0) \) and \( f(\infty) \).
(b) Verify your answer in part (a) by finding \( f(t) \) using partial fractions.

Problem 3.
Determine the initial and final values of \( f(t) \), if they exist, given that:

(a) \( F(s) = \frac{s^2 + 3}{s^3 + 4s^2 + 6} \) 
(b) \( F(s) = \frac{s^2 - 2s + 1}{(s - 2)(s^2 + 2s + 4)} \)

Problem 4.
Show that
\[ L^{-1}\left[ \frac{4s^2 + 7s + 13}{(s + 2)(s^2 + 2s + 5)} \right] = \sqrt{2}e^{-t}(\cos(2t + 45^\circ) + 3e^{-2t})u(t) \]

Problem 5.
Determine \( i(t) \) in the circuit below by means of the Laplace transform.

\[ \text{Diagram of a circuit with a 1Ω resistor, a 1H inductor, a 1F capacitor, and a 1V voltage source.} \]
Problem 6.

If \( v_0(0) = -1 \text{V} \), obtain \( v_0(t) \) in the circuit below.

\[
\begin{align*}
\text{1 \, \Omega} & \quad \text{1 \, \Omega} \\
\text{3 \, u(t)} & \quad \text{+} & \quad \text{v}_0 & \quad \text{-} & \quad \text{0.5 F} & \quad \text{4 \, u(t)} \\
\end{align*}
\]

Problem 7.

Find the input impedance \( Z_{\text{in}}(s) \) of each of the circuits below.

Problem 8.

Solve for the mesh currents in the circuit below. You may leave your results in the s-domain.