Problem 1.

Find the magnitude and phase of the following complex numbers:

$$z_1 = 3 + 5i, \qquad z_2 = \frac{-5 - i}{1 + i}, \qquad z_3 = 4 - 5i$$

Problem 2.

Find the Laplace transform of the following functions:

$$f_1(t) = t^2 + 2t + 5, \qquad f_2(t) = -e^{-2t}\cos(3t)$$

Problem 3.

Determine the inverse Laplace transform of the following:

$$F_1(s) = \frac{s}{(s+2)^2 + 16}, \qquad F_2(s) = \frac{2s^2 + 3s - 5}{s(s+1)(s+2)}, \qquad F_3(s) = \frac{3s}{(s+2)^2(s+3)}$$

Problem 4.

Solve the following differential equation using Laplace transforms:

$$\ddot{y} - 3\dot{y} + 2y = 4, \qquad y(0) = 0, \quad \dot{y}(0) = -1$$

Problem 5.

Given:

$$F(s) = \frac{3}{s(s^2 + 2s + 10)}$$

find the final value of $f(t)$ using (a) the final value theorem, and (b) computing $\lim_{t \to \infty} f(t)$.