Problem 1. Find the Laplace transform of the following functions:

(a) $\cos^2 \omega t$

(b) $t^2 e^{-3t}$

(c) $t \cos 4t$

Problem 2. Find the inverse Laplace transform of the following functions:

(a) $\dfrac{5s + 1}{s^2 - 25}$

(b) $\dfrac{21}{(s + \sqrt{2})^4}$

(c) $\dfrac{20}{s^3 - 2\pi s^2}$

Problem 3. Solve the Initial Value Problem

$$y'' - y' - 6y = 0 \quad y(0) = 11 \quad y'(0) = 28.$$

Problem 4. Solve the Initial Value Problem

$$y'' + 3y' - 4y = 6e^{2t-3} \quad y(1.5) = 4 \quad y'(1.5) = 5.$$

Problem 5. Solve the Initial Value Problem

$$y'' + 6y' + 8y = e^{-3t} - e^{-5t} \quad y(0) = 0 \quad y'(0) = 0.$$