1- Calculate and plot the Fourier transform for x(t):

$$x(t) = \cos(\frac{3\pi}{2}t)e^{-\frac{t^2}{2}}$$

2- Find the output y(t) for a system for an input x(t)= e$^{(-2t)}$ u(t) if this system having an impulse response h(t)= 2e$^{(-2t)}$ u(t).

3- Find the impulse response of a system with frequency response

$$H(j\omega) = \frac{(\sin^2(3\omega))\cos\omega}{\omega^2}.$$

4- Consider LTI system initially at rest and described by the differential equation:

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 9y(t) = \frac{d^2x(t)}{dt^2} + 3\frac{dx(t)}{dt} + 2x(t).$$

Find the impulse response of that system h(t).

The inverse of this system is also initially at rest. Find the deferential equation describing the inverse system, and find its impulse response.