

EE422G Homework #1 (10 points)

Due date: January 18, 2006

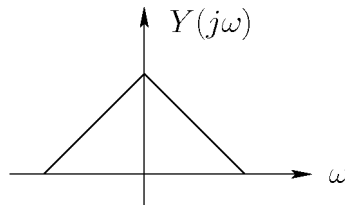
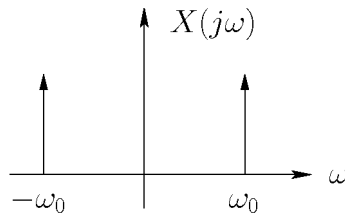
1. (2 pts) Determine which of the following systems are linear. Explain your answer.

(a) $\frac{dy(t)}{dt} + 3y(t) = 4x(t)$

(b) The impulse response: $h(t) = \delta(t + 2)$

(c) $y(t) = x^2(t) + 2\frac{dx(t)}{dt}$

- (d) The followings show the Fourier Transforms of the input $x(t)$ and $y(t)$:



2. (2 pts) Give the definition of Fourier transform and Fourier series. Does every signal have a Fourier transform? If yes, prove it. If not, give a counter-example.
3. (2 pts) Get the Laplace transform for the following transform and the corresponding Region Of Convergence (ROC):

(a) $x(t) = \sin(\omega t)u(t)$

(b) $x(t) = \delta(t - t_0)$, $t_0 > 0$

4. (2 pts) Use Matlab to plot y versus t with $t = 0 : 0.01 : 5$ and y defined as:

$$y = 3e^{-4t} \cos(5t) - 2e^{-3t} \sin(2t) + \frac{t^2}{t+1}$$

5. (2 pts) Given two polynomials:

$$f(x) = x^5 - 3x^4 + 5x^2 + 7x + 9$$

and

$$g(x) = 2x^6 - 8x^4 + 4x^2 + 10x + 12$$

Find all the solutions to the equation

$$f(x)g(x) = 0$$

Hint: Run help on Matlab commands “roots” and “conv”.