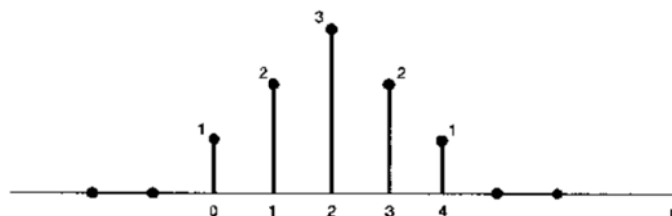


Homework No. 5**Due 18:10, Dec 30, 2010**

1. Consider a non-recursive filter with the impulse response shown in the following figure. What is the group delay as a function of frequency for this filter?



2. A causal LTI filter has the frequency response $H(j\omega) = -2j\omega$. For each of the input signals given below, determine the filtered output signal $y(t)$.
- (a) $x(t) = e^{jt}$
- (b) $x(t) = \sin(\omega_0 t)u(t)$
- (c) $X(j\omega) = \frac{1}{2 + j\omega}$
3. A system has the indicated transfer function $H(s)$. Determine the impulse response, assuming (a) that the system is causal and (b) that the system is stable. (10%)

$$H(s) = \frac{2s^2 + 2s - 2}{s^2 - 1}$$

4. Find the Laplace transform of following signals; indicate the ROC of each signal with figure also. (15%)
- (a) $x(t) = -e^{-at}u(t)$.
- (b) $x(t) = e^{-2t}u(t) + e^{-t}(\cos 3t)u(t)$
- (c) $x(t) = \delta(t) - \frac{4}{3}e^{-t}u(t) + \frac{1}{3}e^{2t}u(t)$