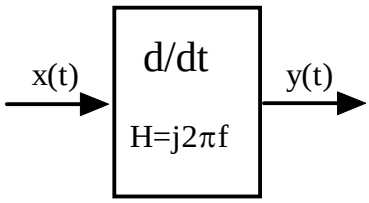
EE411 Homework 6

1. For the differentiator shown below, find the output y(t) if the input is given by
   (a) $x(t) = u(t)$,
   (b) $x(t) = e^{j2\pi f_0 t}$



2. For the LTI system shown in Fig. 2, the unit impulse response of **System A** is $h(t) = e^{-t}u(t)$. Find the system response $y(t)$ if the input is $x(t)$ shown in Fig. 1.

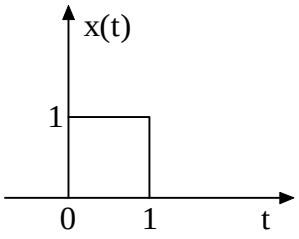


Fig. 1

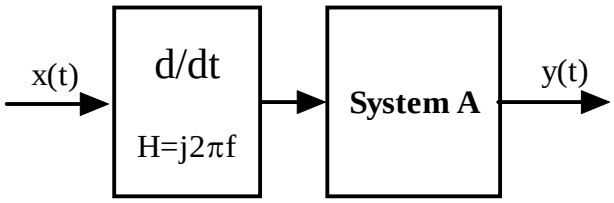
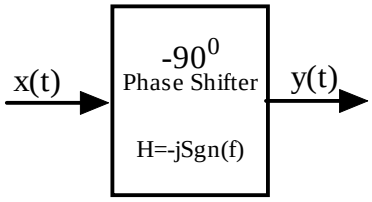


Fig. 2

3. For the -90^0 Phase Shifter shown below, find the output y(t) if the input is given by
   (a) $x(t) = e^{-j2\pi f_0 t}$, ($f_0 > 0$)
   (b) $x(t) = e^{j2\pi f_0 t} + e^{-j2\pi f_0 t}$, ($f_0 > 0$)



4. The frequency response of the LPF in Fig. 3 is given by

$$H(f)=\begin{cases} e^{-j4\pi f} & |f|\le 1200Hz \\ 0 & otherwise \end{cases}$$

Find the output $y(t)$ if the input signal is

(a) $x(t)=8\cos 2\pi f_0 t+3\cos 3\pi f_0 t$, where $f_0=900Hz$.

(b) $x(t)=\sum_{n=-\infty}^{\infty}\frac{1}{1+n^2}\cdot e^{j2\pi n f_0 t}$, where $f_0=700Hz$.

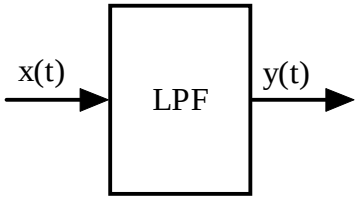


Fig. 3