



Figure 1: Continuous-time signals

EECS20n, Quiz 5 Solution, 4/25/03

- Three pairs of continuous-time signals x and h are specified in figure 1. For each pair sketch the signal $y = h * x$. Denote important values of $t, y(t)$.
- Recall the DTFT pair:

$$\forall \omega \in \text{Reals}, X(\omega) = \sum_{m=-\infty}^{\infty} x(m)e^{-i\omega m}, \quad \forall n \in \text{Integers}, x(n) = \frac{1}{2\pi} \int_0^{2\pi} X(\omega)e^{i\omega n} d\omega.$$

Fill in the blanks in the following DTFT transform pairs:

- $\forall n, x(n) = \delta(n)$ (Kronecker delta) $\forall \omega, X(\omega) = 1$
- $\forall \omega, X(\omega) = e^{-i\omega N}$ $\forall n, x(n) = \delta(n - N)$

- Recall the CTFT pair:

$$\forall \omega \in \text{Reals}, X(\omega) = \int_{-\infty}^{\infty} x(t)e^{-i\omega t} dt, \quad \forall t \in \text{Reals}, x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(\omega)e^{i\omega t} d\omega.$$

Fill in the blanks in the following CTFT transform pairs:

- $\forall t, x(t) = e^{i60t}$ $\forall \omega, X(\omega) = 2\pi\delta(\omega - 60)$
- $\forall \omega, X(\omega) = \delta(\omega - 30) + \delta(\omega + 30)$ (Dirac delta) $\forall t, x(t) = \frac{1}{\pi} \cos(30t)$