System I/O Relationship

\[ v_o(t) = H(s) \cdot V_i(s) \]

\[ V_0(s) = L^{-1}\left[ H(s) \cdot V_i(s) \right] = ? \]

- haven't yet covered \( L^{-1} \) of product of two functions.

Convolution

Let \( T \rightarrow \delta \)

\[ v_i(t) = \int_{-\infty}^{\infty} s(t-2) \cdot v_i(t) \, dt \]

\[ v_o(t) = \int_{-\infty}^{\infty} h(t-2) \cdot v_i(t) \, dt = \int_{-\infty}^{\infty} h(t) \cdot v_i(t-2) \, dt \]

Formally, convolution goes to \( \delta \) but for Laplace

\[ v_i(t) = 0 \text{ for } t < 0 \]

\[ h(t) \text{ must be } \delta \text{ for } t > 0 \]

For the system is causal.
Graphical Convolution

\[ \int_{0}^{\infty} h(t-t) v(t) \, dt \]

= \int_{0}^{\infty} v(t) h(t) \, dt

flip - stick - pull