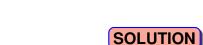
EXERCISE 9.2: The input and output of the time delay system satisfy $y(t) = x(t - t_d)$ where t_d is the delay of the system. Show that the time delay system is a time-invariant system.

McClellan, Schafer and Yoder, Signal Processing First, ISBN 0-13-065562-7.



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Delay system is y(t) = x(t-ta)

Delay the input to get w(t) = x(t-t,)

Then use w(t) as the input to obtain

$$\chi(t) = x(t-t_i-t_i)$$

Compare to delaying the output by t,

$$y(t-t_i) = x(t-t_i-t_d)$$

Thus we see that

$$y_{w}(t) = y(t-t_i)$$

Which verifies that the system is Time-Invariant