

Example 9-8: Integrator is Linear

The integrator system is a linear system. To show this, note that if $x(t) = \alpha x_1(t) + \beta x_2(t)$, the corresponding output is

$$y(t) = \int_{-\infty}^{t} x(\tau)d\tau = \int_{-\infty}^{t} [\alpha x_1(\tau) + \beta x_2(\tau)]d\tau$$
$$= \alpha \int_{-\infty}^{t} x_1(\tau)d\tau + \beta \int_{-\infty}^{t} x_2(\tau)d\tau$$
$$= \alpha y_1(t) + \beta y_2(t)$$

Thus, the integrator system is a linear system.

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