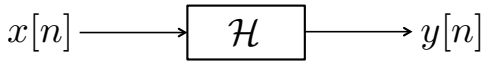
EECS 16A Designing Information Devices and Systems I
Spring 2015 Discussion 12W

LTI systems



Any Linear Time-invariant (LTI) system $\mathscr{H}$ has two properties:

- Linear: $\mathscr{H}(\alpha x_1[n] + \beta x_2[n]) = \alpha\mathscr{H}(x_1[n]) + \beta\mathscr{H}(x_2[n])$
- Time-invariant: If $y[n] = \mathscr{H}(x[n])$ then $y[n-r] = \mathscr{H}(x[n-r])$

1. LTI or not?

(a) Is the system represented by $y(t) = \mathscr{H}(x(t))$ an LTI system for the following?

i. $y(t) = \int_{-\infty}^{t} x(\tau)d\tau$

ii. $y(t) = \int_{-\infty}^{t} \tau x(\tau)d\tau$

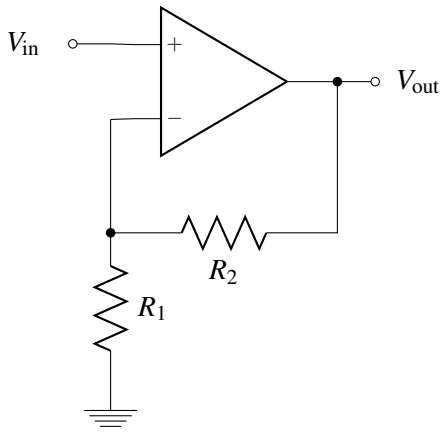
iii. $y(t) = \cos(x(t))$

iv. $y(t) = e^t x(t)$

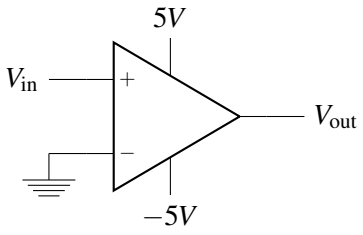
v. $y[n] = x[\alpha n]$ where α is a non-zero integer

vi. $y[n] = 3x[n] - |x[n-3]|$

(b) Is the system represented by $V_{\text{out}} = \mathscr{H}(V_{\text{in}})$ an LTI system?



(c) Is the system represented by $V_{\text{out}} = \mathscr{H}(V_{\text{in}})$ an LTI system?



(d) Is the system represented by $V_{ab} = \mathscr{H}(V_{\text{in}})$ an LTI system?