

System Properties:

1. Determine if the following systems are time-invariant, linear, causal, and/or memoryless?

a) $\frac{dy}{dt} + 6y(t) = 4x(t)$

b) $\frac{dy}{dt} + 4ty(t) = 2x(t)$

c) $y[n] + 2y[n-1] = x[n+1]$

d) $y(t) = \sin(x(t))$

e) $\frac{dy}{dt} + y^2(t) = x(t)$

f) $y[n+1] + 4y[n] = 3x[n+1] - x[n]$

g) $y(t) = \frac{dx}{dt} + x(t)$

h) $y[n] = x[2n]$

i) $y[n] = nx[2n]$

j) $\frac{dy}{dt} + \sin(t)y(t) = 4x(t)$

k) $\frac{d^2y}{dt^2} + 10\frac{dy}{dt} + 4y(t) = \frac{dx}{dt} + 4x(t)$

2. The response of an LTI system to a step input, $x(t) = u(t)$ is $y(t) = (1 - e^{-2t})u(t)$. What is the response to an input of $x(t) = 4u(t) - 4u(t-1)$?