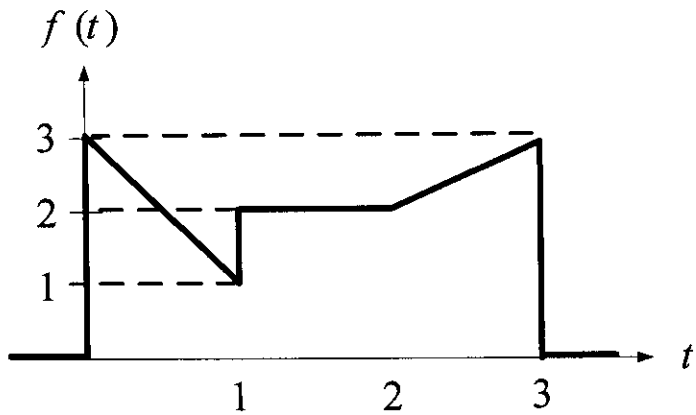
EE 207-03 – Winter 2012(112)
Quiz 1

SER	ID	NAME KEY

(I)



For the function $f(t)$ (signal) shown above , expand the function in terms of singularity functions ?

(II) If the input $x(t)$ and output put $y(t)$ for a system is described as

$$y(t) = x\left(\sqrt{t}\right)$$

Is the system
(a) Linear ? *explain* ?
(b) Causal ? *explain* ?
(c) Time invariance ? *explain* ?

(I) $f(t) = 3u(t) - 2r(t) + 2r(t-1) + u(t-1)$
$+ r(t-2) - r(t-3) - 3u(t-3)$

(II) (a) Linear, Let $y_1(t) = T(x_1(t)) = x_1(\sqrt{t})$
$y_2(t) = T(x_2(t)) = x_2(\sqrt{t})$

Let $g(t) = \alpha_1 x_1(t) + \alpha_2 x_2(t)$
$T(g(t)) = g(\sqrt{t}) = \alpha_1 x_1(\sqrt{t}) + \alpha_2 x_2(\sqrt{t})$
$\Rightarrow T(\alpha_1 x_1(t) + \alpha_2 x_2(t)) = \alpha_1 y_1(t) + \alpha_2 y_2(t) \Rightarrow$ Linear

(b) since $t \leq \sqrt{t}$ for $t \leq 1$

$\Rightarrow$ $y(t)$ depend on future $x(\sqrt{t})$

$\Rightarrow$ system is not Causal

(c) $y(t) = T(x(t)) = x(\sqrt{t})$

$y(t-t_d) = x(\sqrt{t-t_d})$

$T(x(t-t_d)) = x(\sqrt{t} - t_d)$

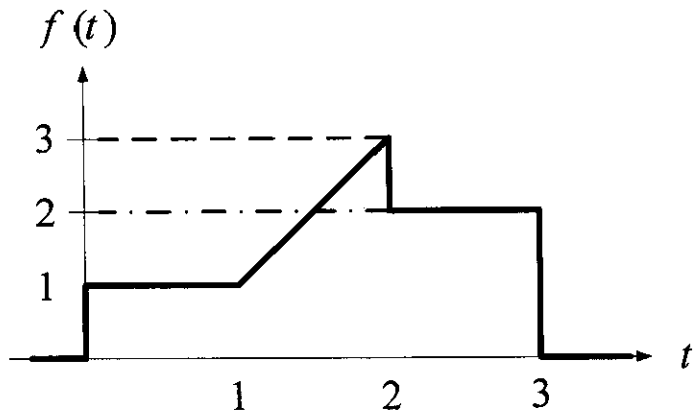
Since $T(x(t-t_d)) \neq y(t-t_d)$

$\Rightarrow$ system is Time variance

EE 207-05 – Winter 2012(112)
Quiz 1

SER	ID	NAME KEY

(I)



For the function (signal) shown above , expand the function in terms of singularity functions ?

(II) If the input $x(t)$ and output put $y(t)$ for a system is described as

$$y(t) = x(t^2)$$

Is the system
(a) Linear ? *explain* ?
(b) Causal ? *explain* ?
(c) Time invariance ? *explain* ?

(I) $f(t) = u(t) + 2r(t-1) - 2r(t-2) - u(t-2)$
$- 2u(t-3)$

(II) (a) Linear / let $y_1(t) = T(x_1(t)) = x_1(t^2)$
$y_2(t) = T(x_2(t)) = x_2(t^2)$

let $g(t) = \alpha_1 x_1(t) + \alpha_2 x_2(t)$
$T(g(t)) = g(t^2) = \alpha_1 x_1(t^2) + \alpha_2 x_2(t^2)$
$\Rightarrow T(\alpha_1 x_1(t) + \alpha_2 x_2(t)) = \alpha_1 y_1(t) + \alpha_2 y(t)$ ⇒ linear

(b) Since $t \leq t^2$ for $t \geq 1$

$\Rightarrow$ $y(t)$ depend on future $x(t^2)$

$\Rightarrow$ system is not Causal

(c) $y(t) = T(x(t)) = x(t^2)$

~~$y(t-t_d) = x(t^2)$~~

$y(t-t_d) = x((t-t_d)^2)$

$T(x(t-t_d)) = x(t^2 - t_d)$

Since $T(x(t-t_d)) \neq y(t-t_d)$

$\Rightarrow$ system is Time Variance