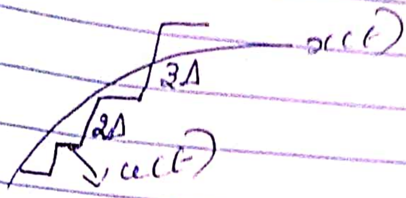
Initial Condition
Case (i)

$\Delta(0) = \Delta$

$e(0) = +1$

$u(t)$ = Staircase approximation
$x(t)$ = i/p s/g



Input s/g increases very fast

$\Delta = \Delta(n-1)\,e(n) + \Delta(0)\,e(n-1)$

$\underline{n=1}$ $e(1) = +1\ (x(t) > u(t))$

$\Delta = \Delta(0)\,e(1) + \Delta(0)\,e(0)$

$\Delta = \Delta(0) + \Delta(0)$

$\boxed{\Delta(1) = 2\Delta}$

$e(1) = +1\ (x(t) > u(t))$
$e(2) = +1\ (x(t) > u(t))$

$\underline{n=2}$ $e(1) = +1,\ e(2) = +1\ (x(t) > u(t))$

$\Delta = \Delta(1)\,e(2) + \Delta(0)\,e(1)$

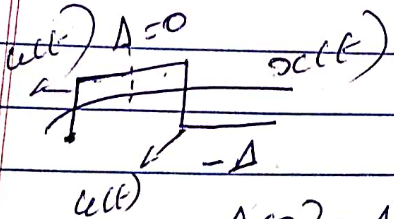
$\Delta = \Delta(1) + \Delta(0)$

$= 2\Delta + \Delta$

$\Delta(2) = 3\Delta$

$e(3) = 0$

Check
if $u(t)$ is present below $x(t)$ $\boxed{e = +1}$
$x(t) > u(t)$
if $u(t)$ is above $x(t)$
$x(t) < u(t)$ $\boxed{e = -1}$



Input s/g is constant

$\Delta(0) = \Delta$

$n=1$ $e(0) = +1$, $e(1) = -1\ (u(t) > x(t))$

$\Delta(1) = \Delta(0)(-1) + \Delta(0)\,e(0)$

$= \Delta - \Delta = 0$

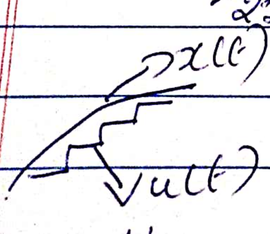
$e(1) = -1\ (u(t) > x(t))$
$e(2) = -1\ (u(t) > x(t))$

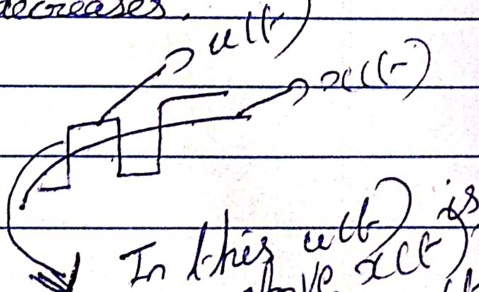
$(u(t) > x(t))$ $e(2) = -1$, $e(1) = -1$

$n=2$ $\Delta(2) = 0(-1) + \Delta(-1)$

$\Delta(2) = -\Delta$

$\frac{y}{2x}$ = slope is decreases.





In this $u(t)$ is below $x(t)$ hence $x(t) > u(t)$

In this $u(t)$ is above $x(t)$
$x(t) < u(t)$