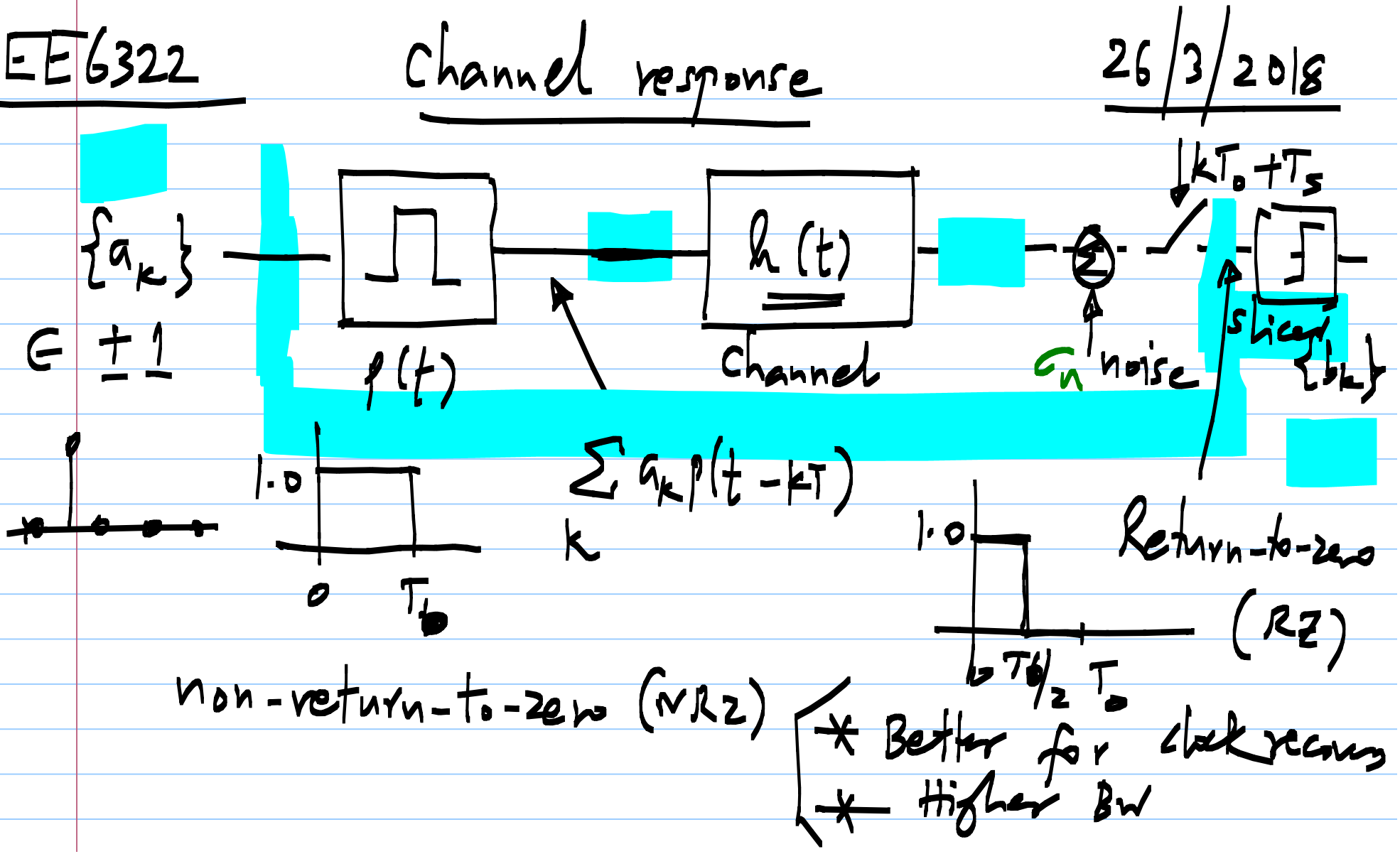
EE6322

Channel response

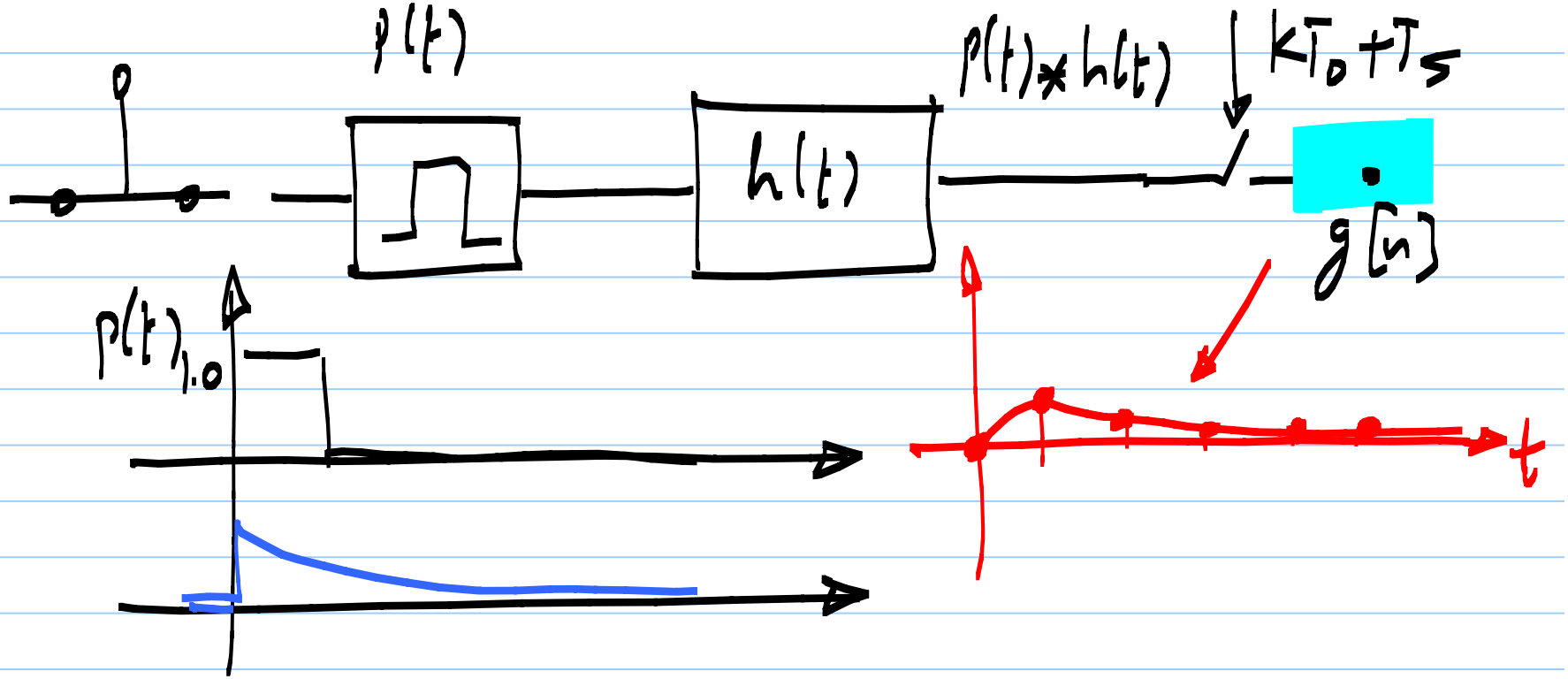
26/3/2018

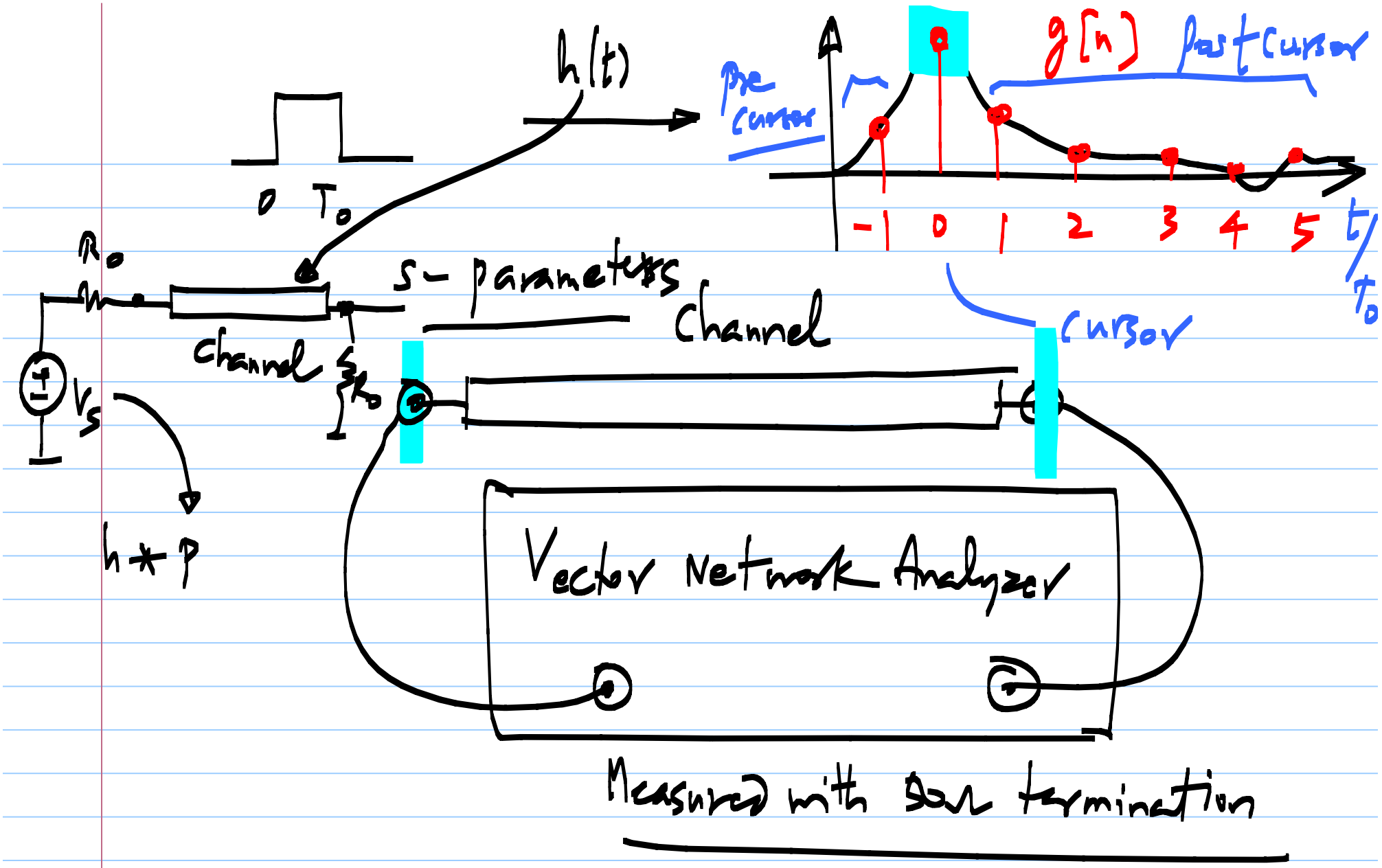


non-return-to-zero (NRZ)

* Better for clock recovery
* Higher BW

Characterize the channel from its discrete-time input (before modulation by $p(t)$ to sample) receiver output using a discrete-time system




h(t)
0
T_0
g[n]
pre cursor
post cursor
-1
0
1
2
3
4
5
t/T_0
R_0
S-parameters
Channel
Channel
R_0
V_s
h * p
Cursor
Vector Network Analyzer
Measured with 50Ω termination

Sampled signal @ slicer input

desired ~~receive~~ symbol

$$y[\ell] = \cdot g[0] + a_{\ell-1} \cdot g[1] + \ldots$$

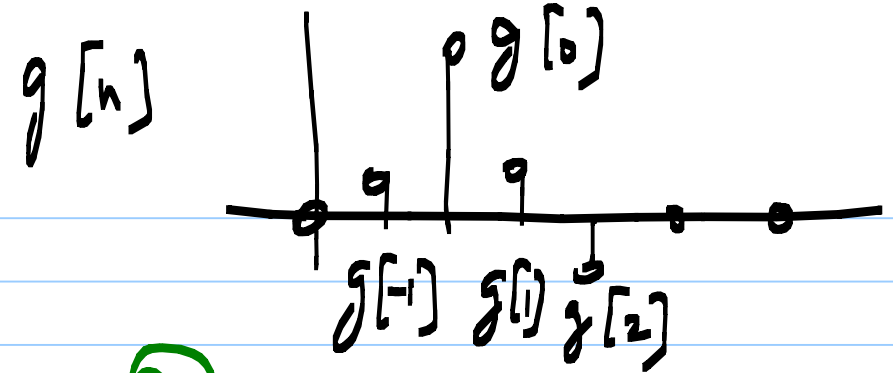
$$+ a_{\ell+1} \cdot g[-1] + \ldots$$

post-cursor ISI

Pre-cursor ISI

symbols after a_ℓ

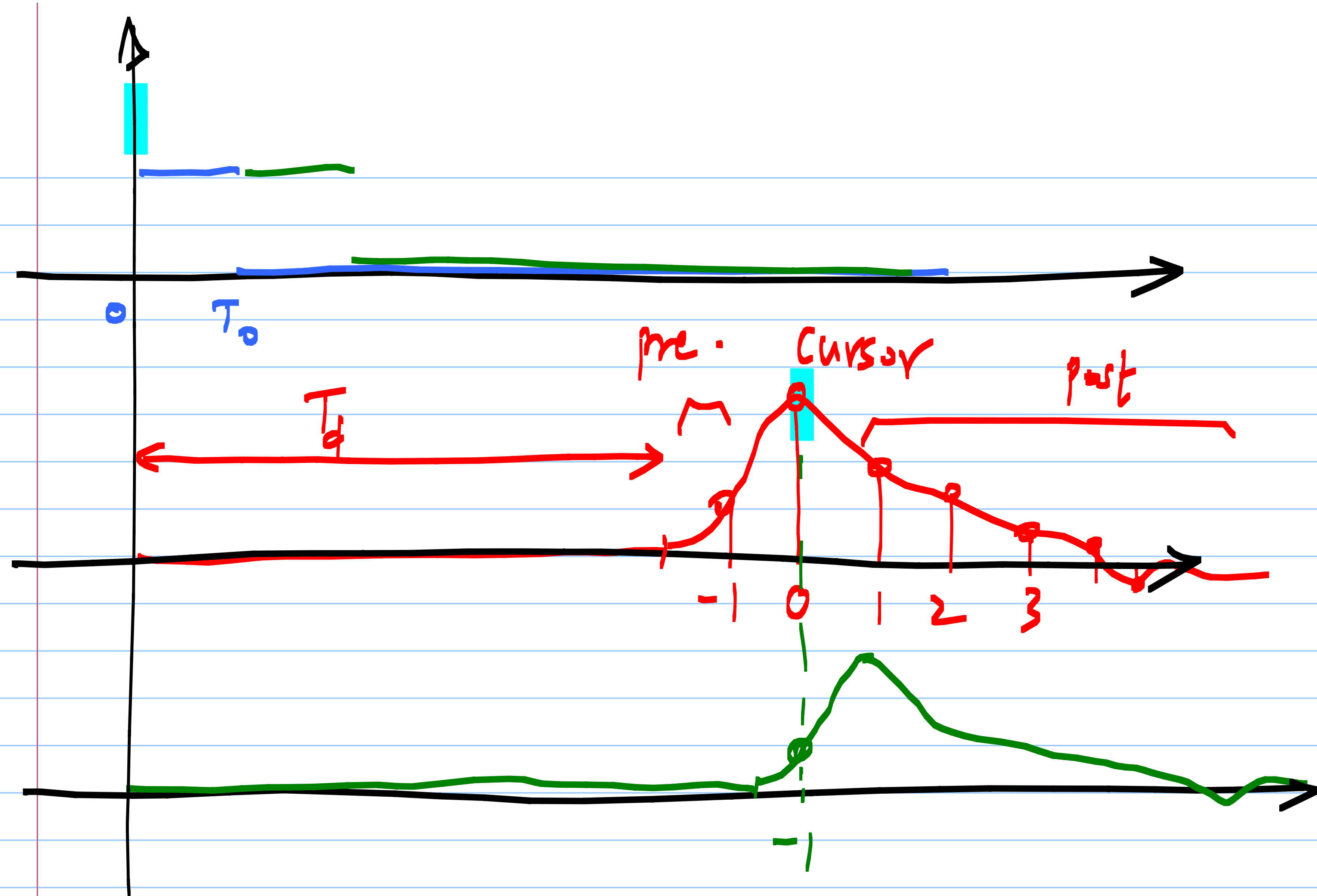
Inter-symbol interference

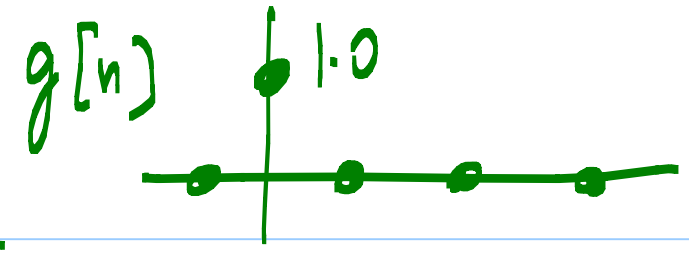


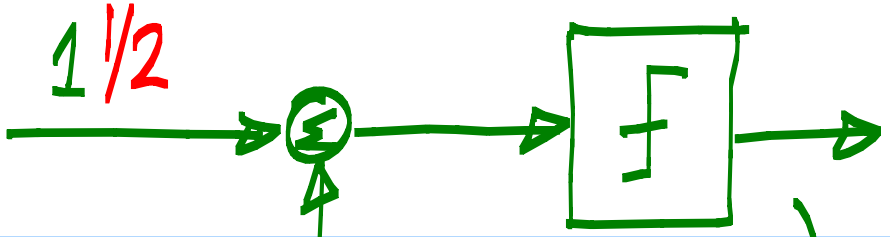
$a_e = 1$

$$y[e] = g[0] + a_{e-1} \cdot g[1] + a_{e-2}\, g[2] + a_{e+1}\, g[-1]$$

1


0
T_0
T_d
pre.
Cursor
post
-1
0
1
2
3
-1

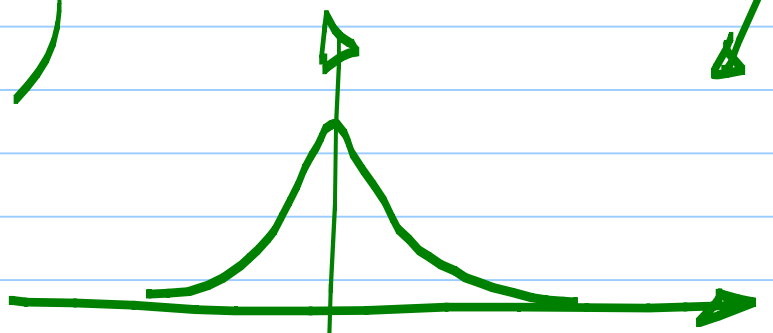




$N(0, \sigma_n)$

$\{N(0, \sigma_n)\}$

$$p_X(x) = \frac{1}{\sqrt{2\pi}\,\sigma_n} \cdot \exp\left(-\frac{x^2}{2\sigma_n^2}\right)$$



$$\int_{-\infty}^{-1} p_X(x)\,dx$$

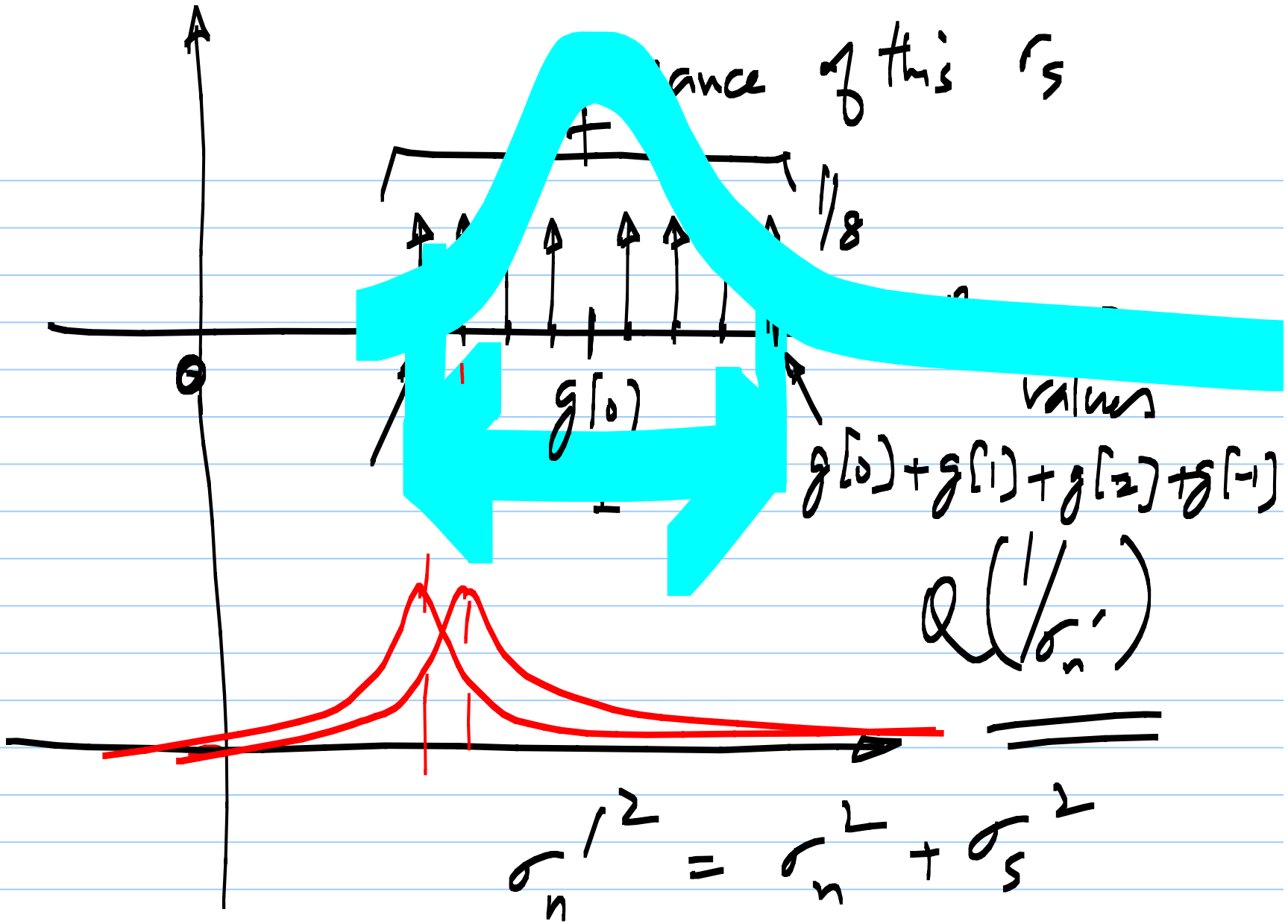
$$Q\left(\frac{1}{[\sigma_n]}\right)$$

$$Q\left(\frac{1/2}{\sigma_n}\right)$$

$a_l = \pm 1$

	a_{l+1}	a_{l-1}	a_{l-2}	Received value :
$1/8$	-1	-1	-1	$Q\left(g[0] - g[-1] - g[1] - g[2]/\sigma_n\right)$
$1/8$	-1	-1	1	$Q\left(g[0] - g[-1] - g[1] + g[2]/\sigma_n\right)$
	-1	1	-1	
	-1	1	1	
	1	-1	-1	
	1	-1	1	
	1	1	-1	
	1	1	1	$Q\left(g[0] + g[-1] + g[1] + g[2]/\sigma_n\right)$

$\times 1/8$

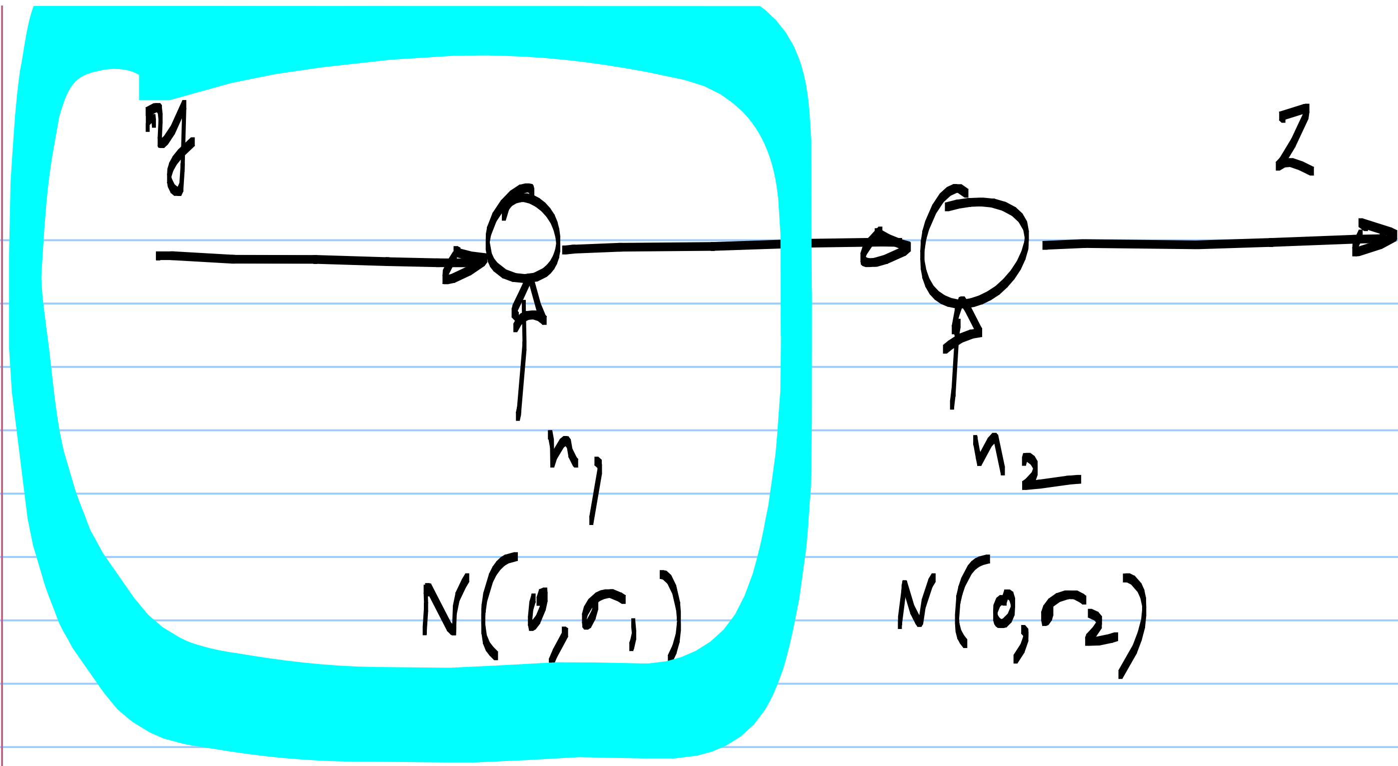


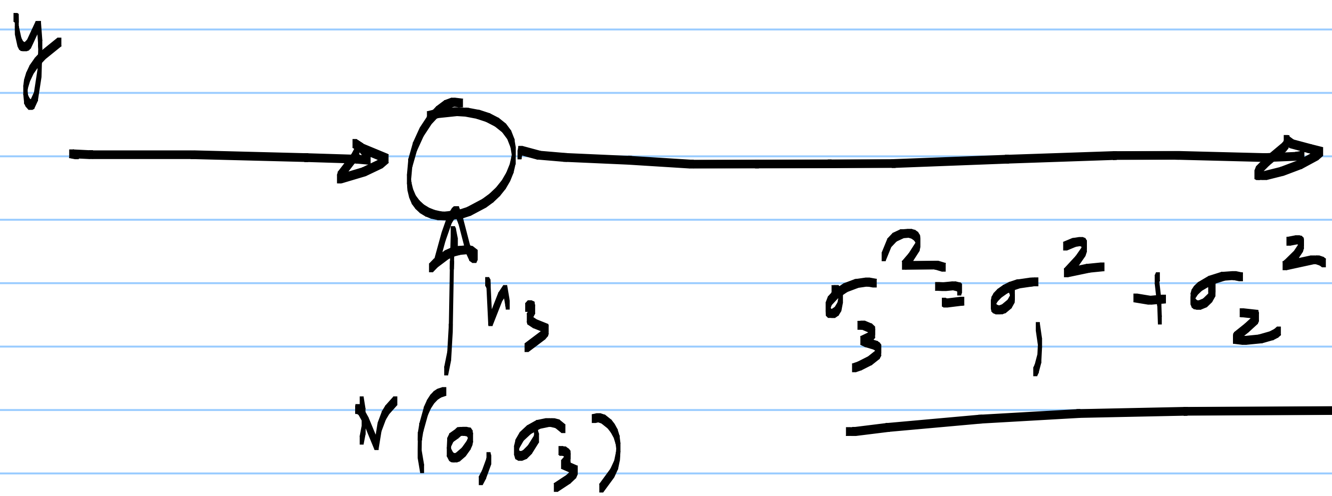
$$\sigma_n'^2 = \sigma_n^2 + \sigma_s^2$$

$g[n]$: sampled pulse re[illegible]

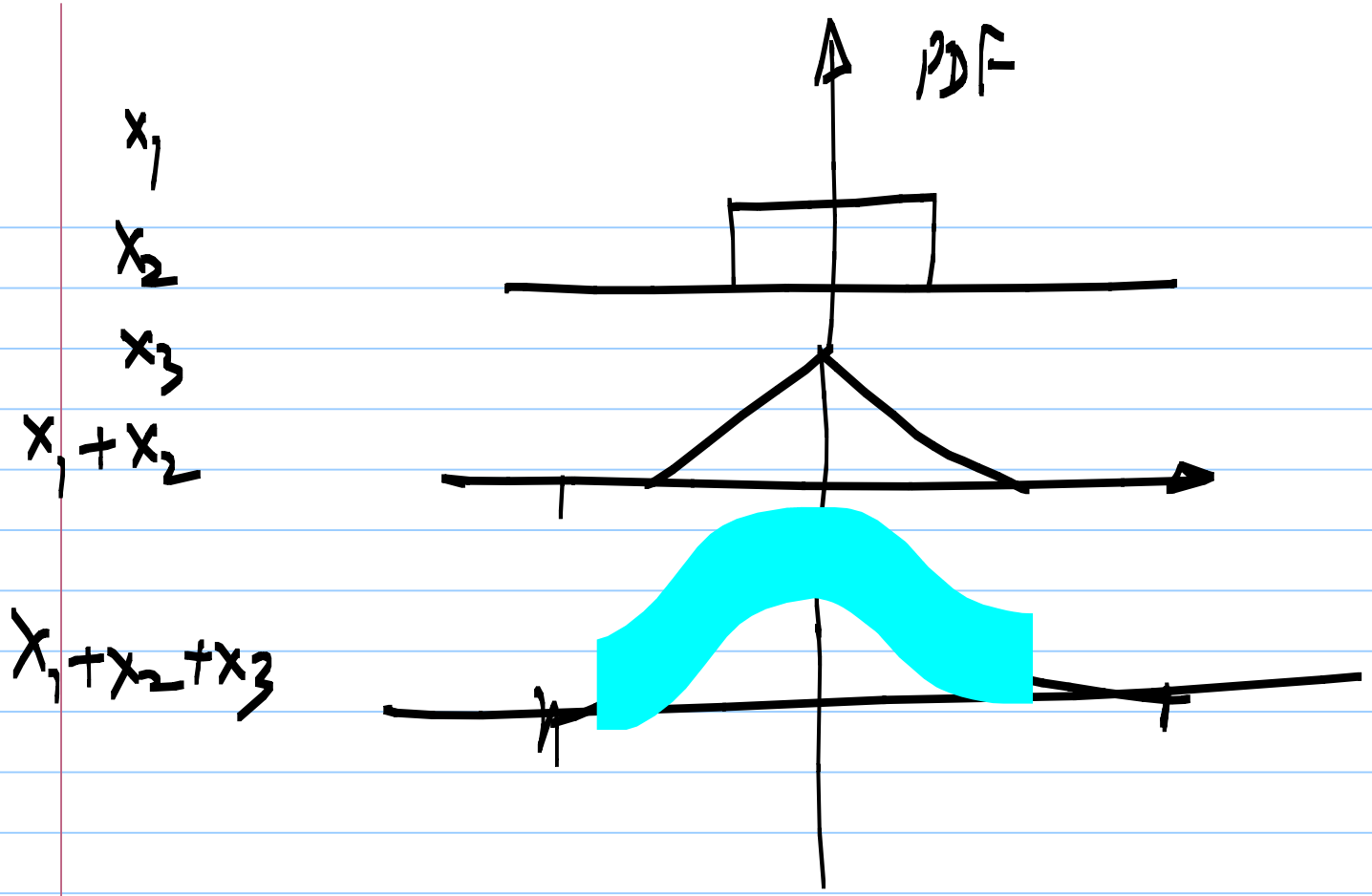
Worst case received symbol : $g[0] - \sum_{k \neq 0} |g[k]|$

$g[0]$: cursor.





$$\sigma_3^2 = \sigma_1^2 + \sigma_2^2$$


PDF
X_1
X_2
X_3
$X_1 + X_2$
$X_1 + X_2 + X_3$