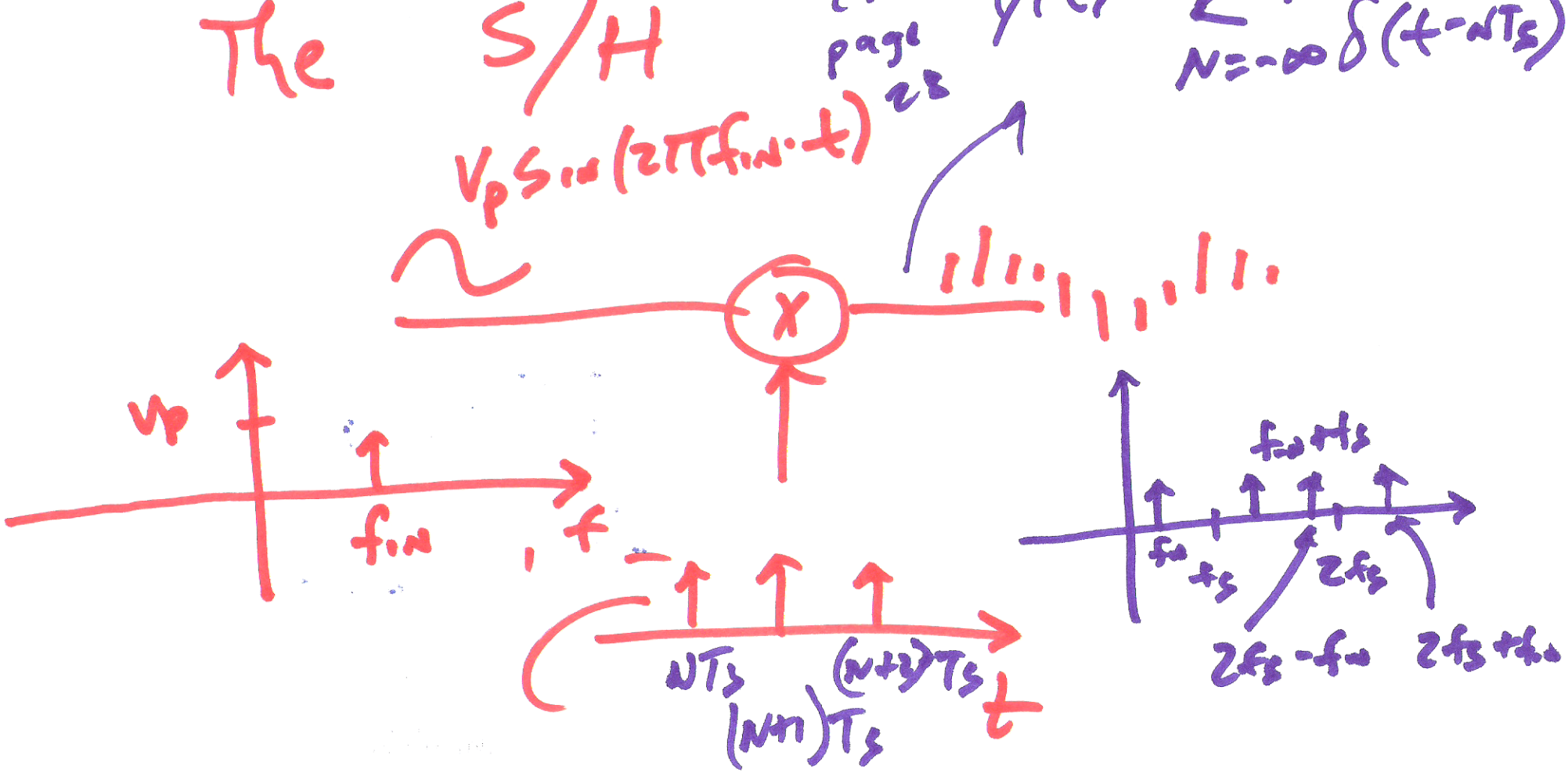
S/H

Sept. 8, 2014

The S/H

2.1 page 28

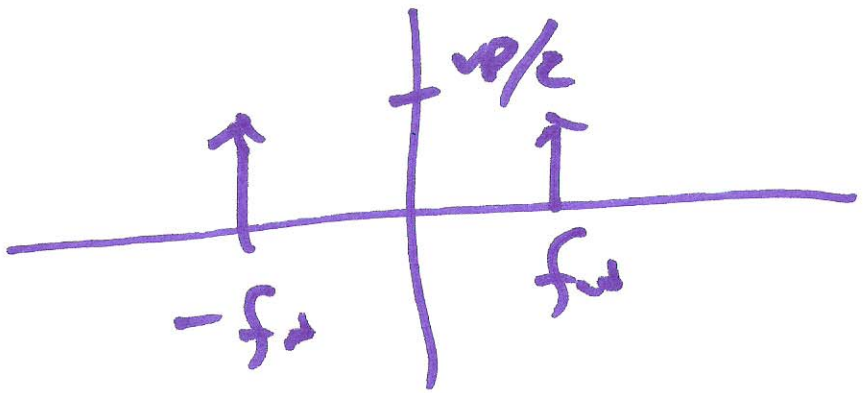
$$y(t) = \sum_{N=-\infty}^{\infty} V_p \sin(2\pi f_{in} t) \cdot \delta(t - nT_s)$$



$$y(t) = \sum_{N=-\infty}^{\infty} V_p \sin(2\pi f_s t) \cdot \delta(t - NT_s)$$

OUTPUT of impulse sampler

$$Y(f) = \frac{V_p}{2jT_s} \sum_{K=-\infty}^{\infty} \left[\delta(f - f_{in} - Kf_s) - \delta(f + f_{in} - Kf_s) \right]$$



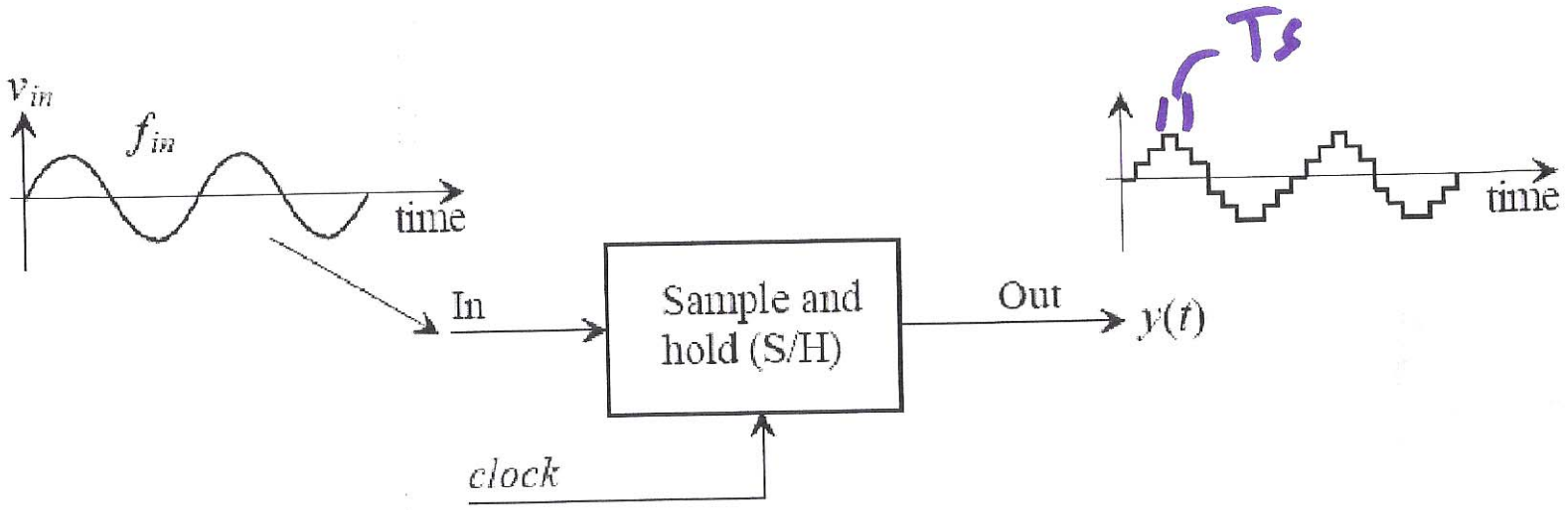
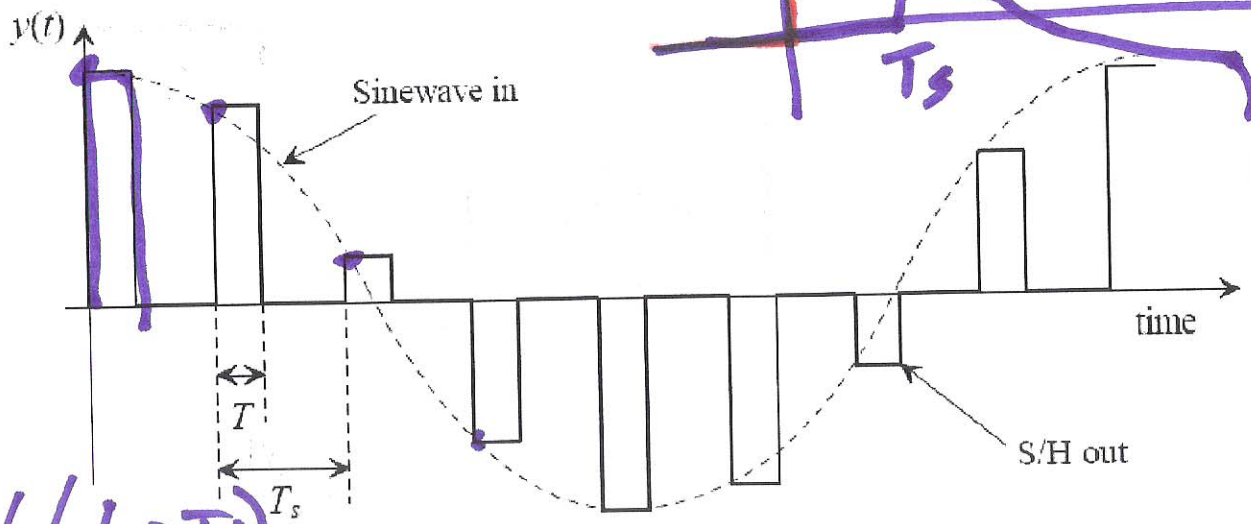


Figure 2.14 Sampling and holding an input sinewave.



u(t) - u(t-Ts)

u(t)

1

Ts

t

u(t-Ts)

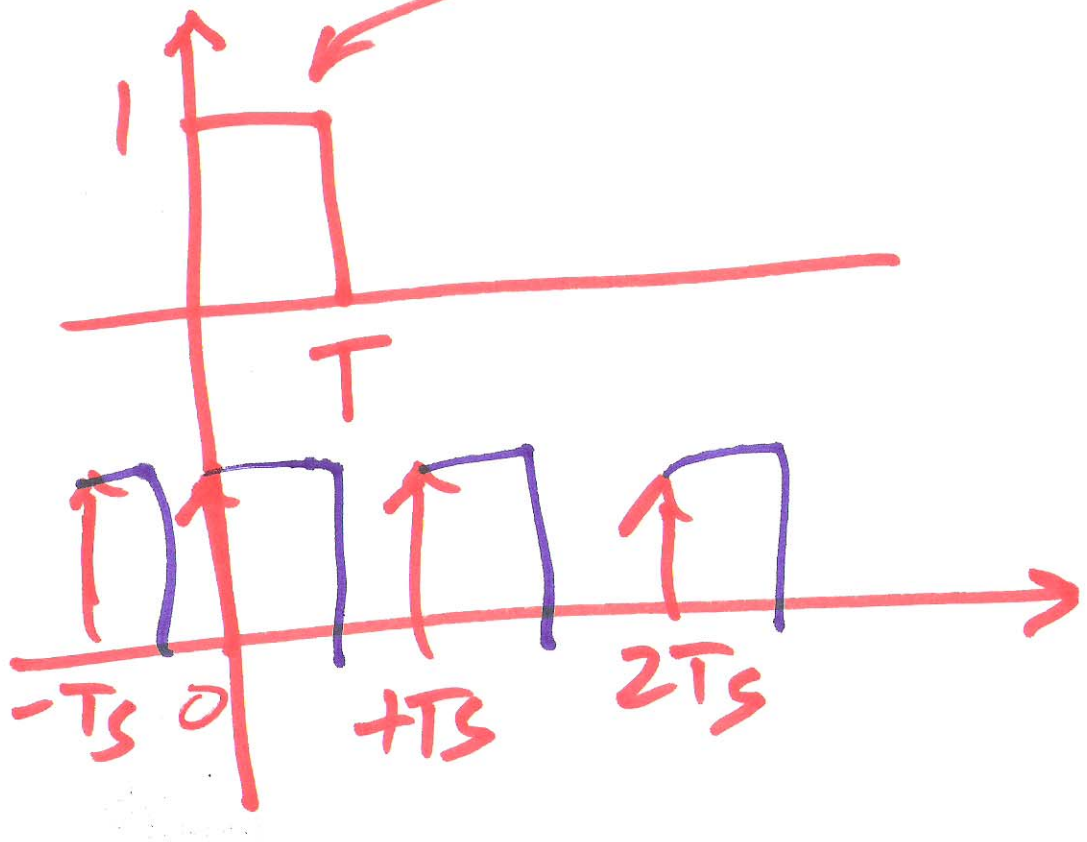
Figure 2.15 Sample-and-hold output with return to zero format.

$$y(t) = \sum_{N=-\infty}^{\infty} V_p \sin(2\pi f_{in} \cdot NT_s)\left[u(t-NT_s) - u(t-NT_s-T)\right]$$

4)

$$u(t-nT_s) - u(t-nT_s-T)$$

$$= \{\delta(t-nT_s) \circledast [u(t) - u(t-T)]\}$$



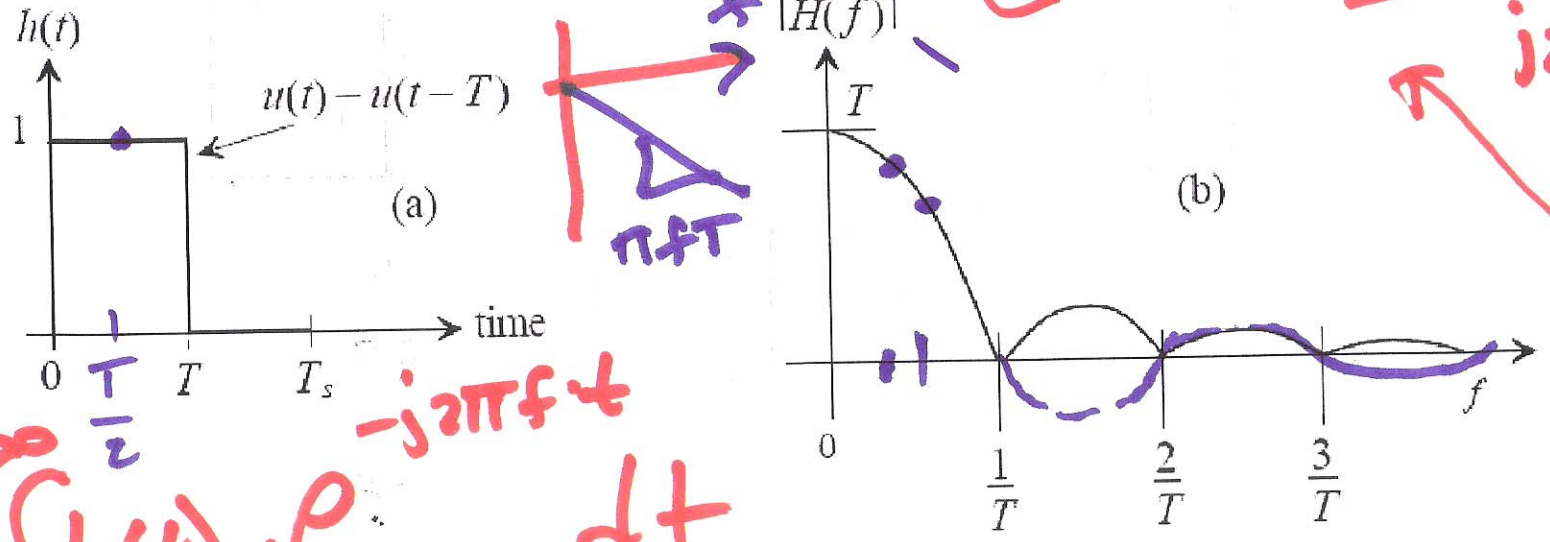
$$y(t) = V_p \sin(2\pi f_m \cdot t) \cdot \sum_{n=-\infty}^{\infty} \delta(t - nT_s) \otimes [u(t) - u(t-T)]$$

$p(t)$

$$y(t) = (V_m(f) \otimes P(f)) \cdot H(f)$$

$$\frac{V_p}{2jT_s} \sum_{k=-\infty}^{\infty} [\delta(\quad) - \delta(\quad)]$$

S/H → $e^{-j2\pi f\frac{T}{2}}\, T\,\mathrm{Sinc}(\pi fT)$ ⟷ $e^{-j\pi fT}\cdot\dfrac{e^{-j\pi fT}-e^{+j\pi fT}}{j2\pi f}$



πfT

$$H(f)=\int_{-\infty}^{\infty} h(t)\cdot e^{-j2\pi ft}\,dt$$

Figure 2.16 (a) Sampling pulse and (b) its spectrum.

$$H(f)\int_0^T e^{-j2\pi f\cdot t}\cdot dt = \frac{-1}{j2\pi f}e^{-j2\pi ft}\Big|_0^T$$

$$= \frac{-1}{j2\pi f}\left[e^{-j2\pi fT}-1\right]$$

7)

$T = T_s$

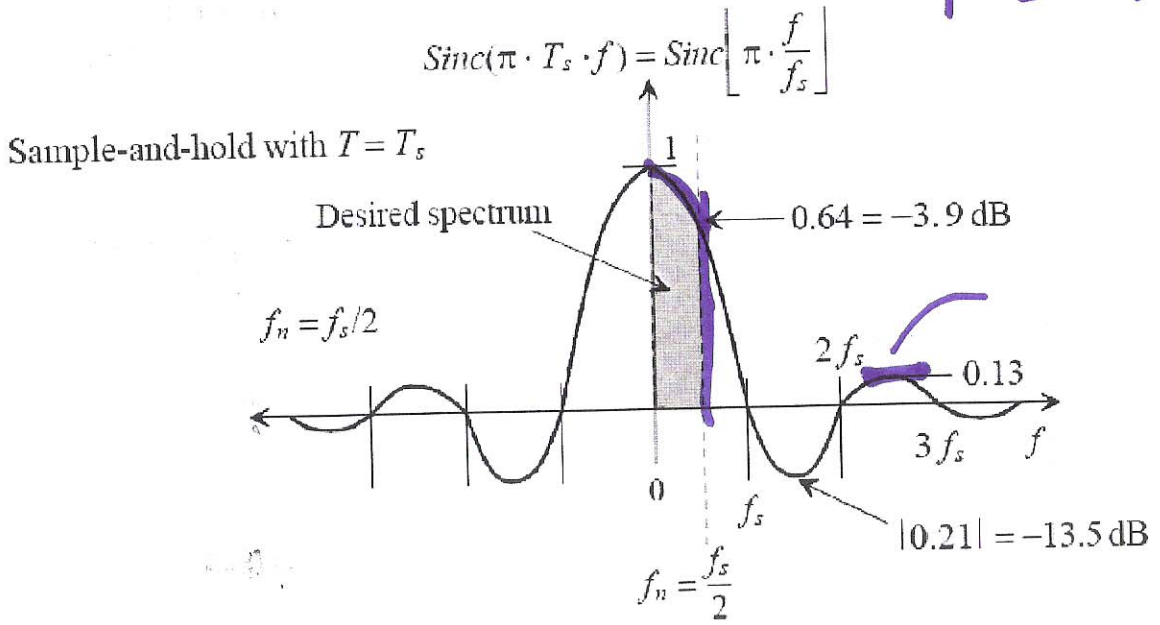


Figure 2.17 The frequency response of a S/H.

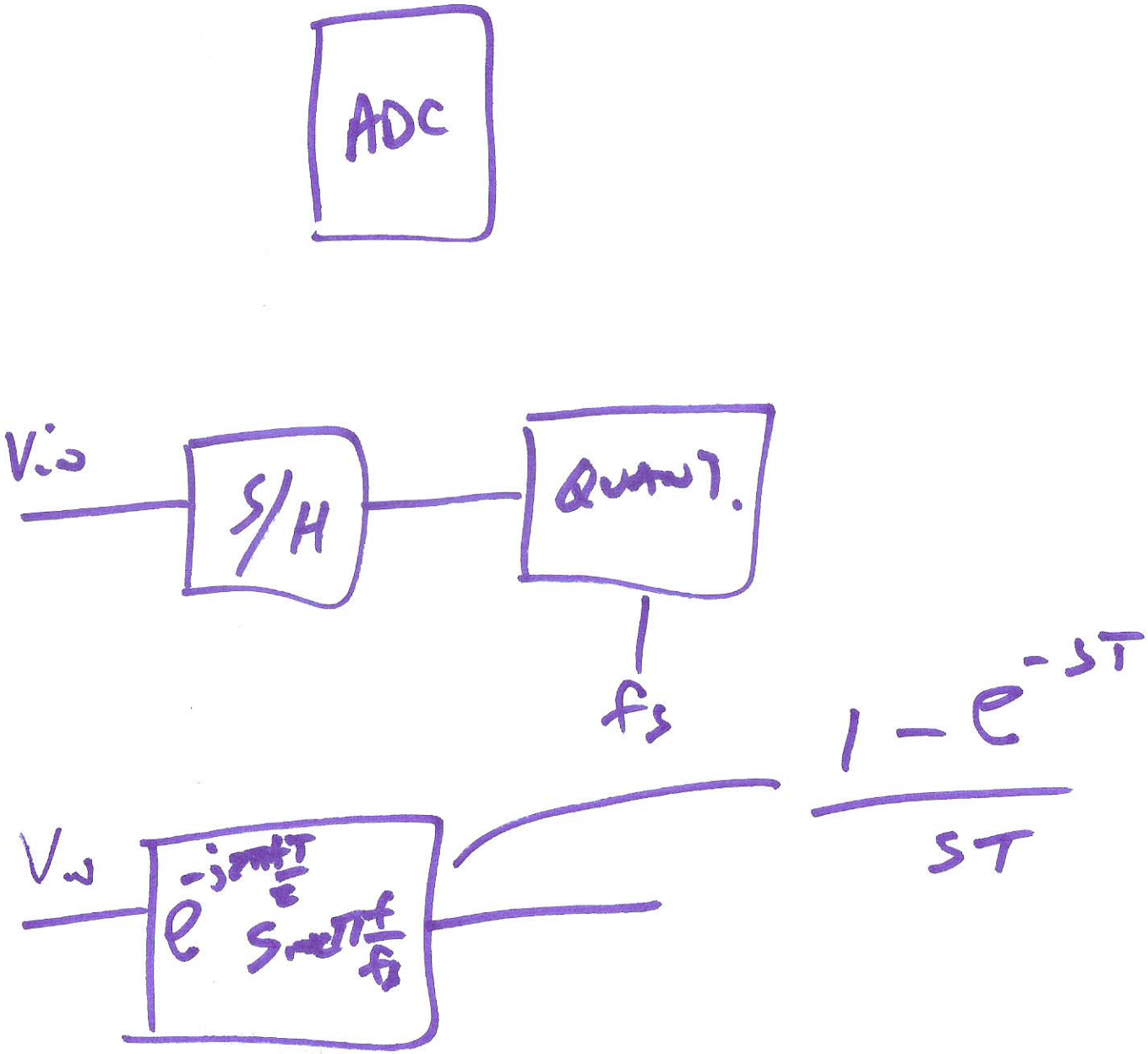
S.N x

$\simeq$ x

$x \simeq 0$

$$\frac{Sinc\ \pi f/f_s}{\frac{Sin\ \pi \frac{f}{f_s}}{\pi \frac{f}{f_s}}} \simeq \frac{\pi \frac{f}{f_s}}{\pi \frac{f}{f_s}} = 1$$

8)


ADC
S/H
Quant.
fs
$\frac{1-e^{-sT}}{sT}$

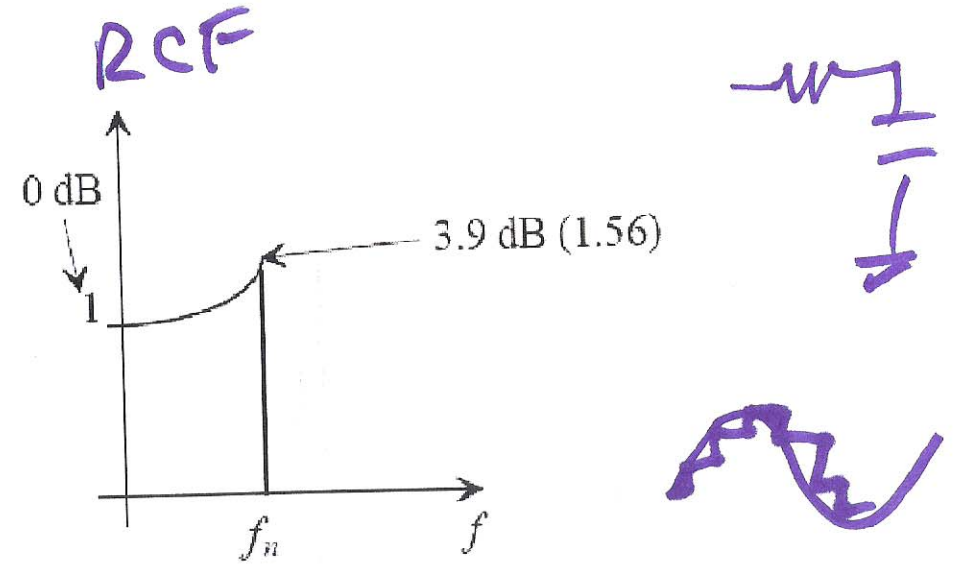
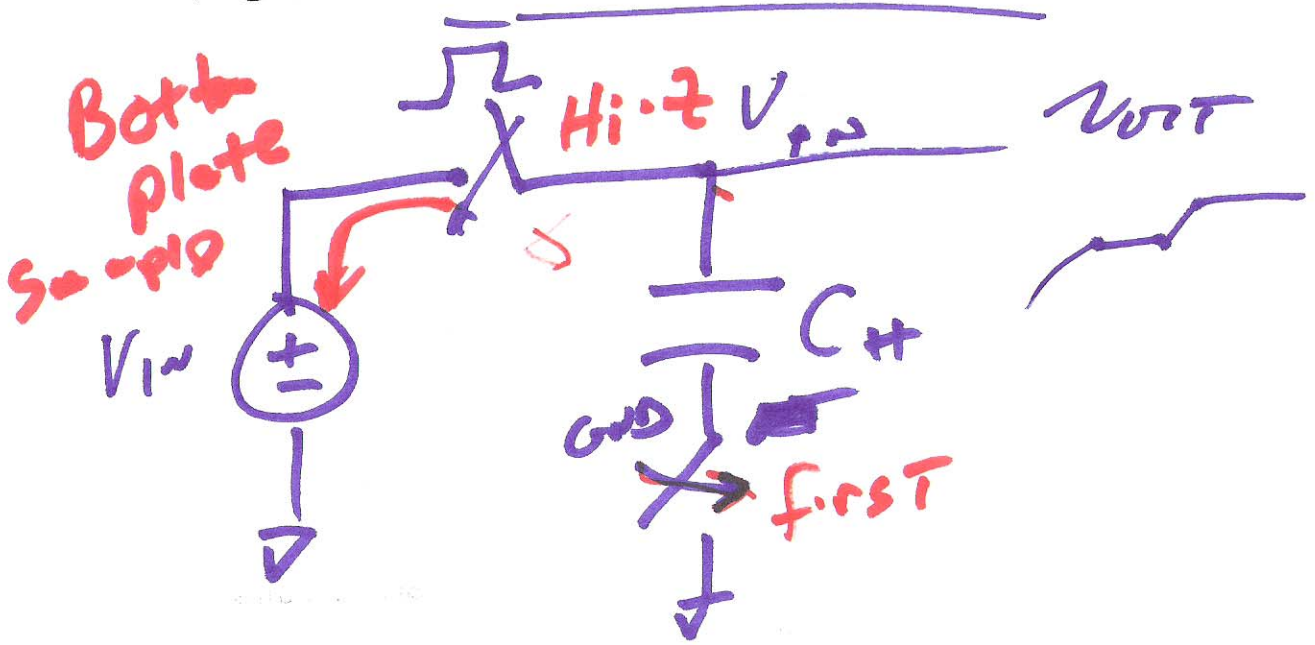


Figure 2.19 Ideal reconstruction filter frequency response for a S/H.



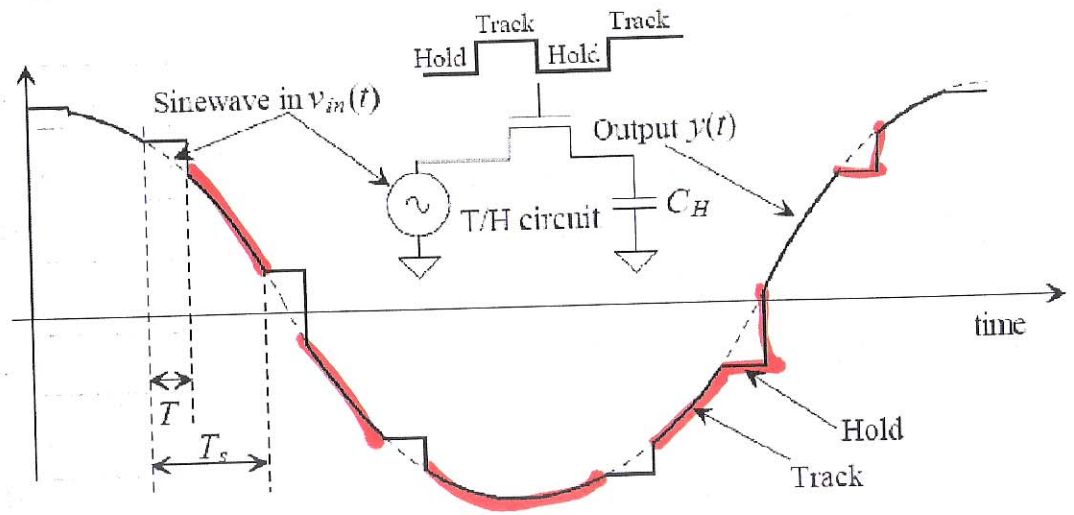


Figure 2.23 Track-and-hold output.