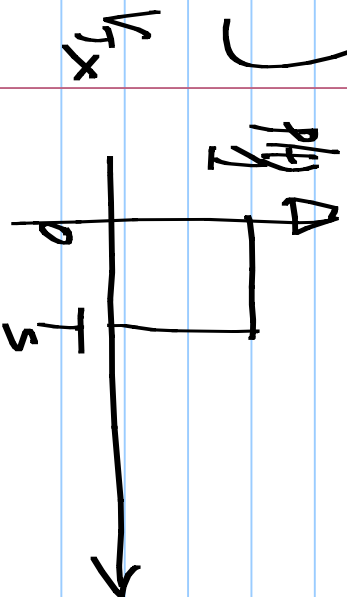
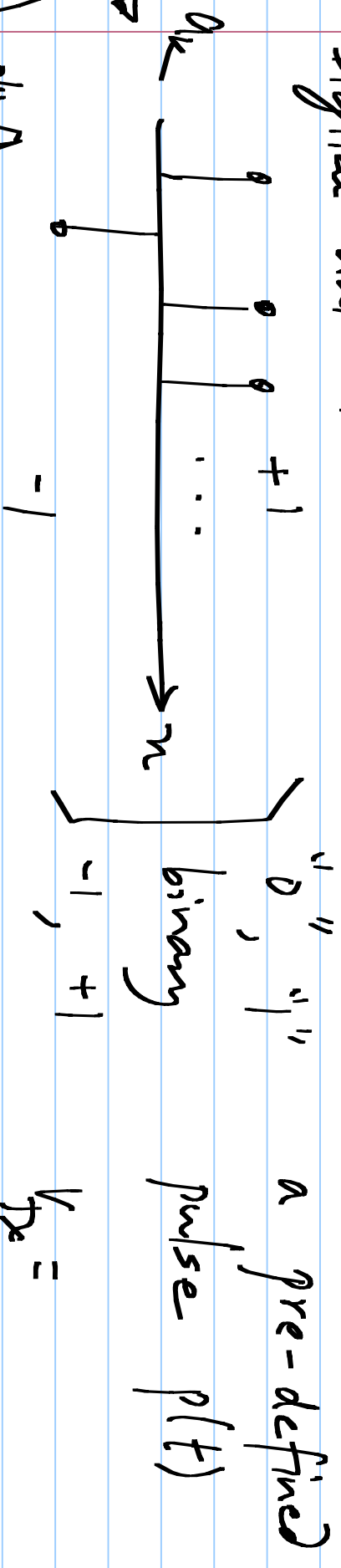


# Lecture 2

Each symbol

Digital data :

represented by



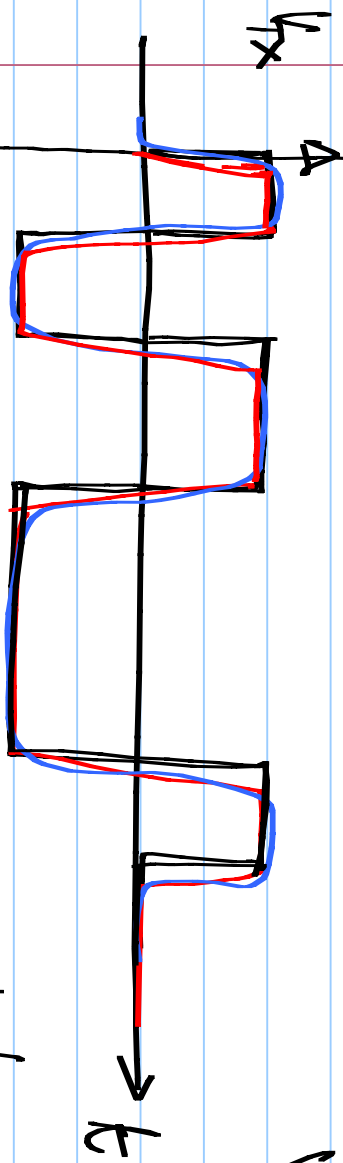
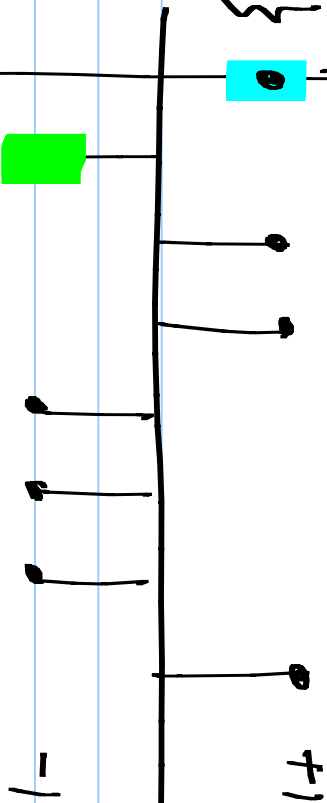
$$\sum a_k \cdot p(t - kT_s)$$

$$f_s = \frac{1}{T_s} \quad \text{symbol period}$$

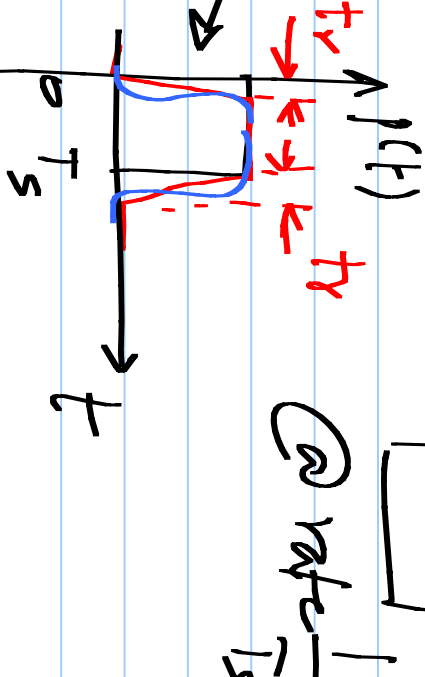
symbol rate

$\{a_k\}$

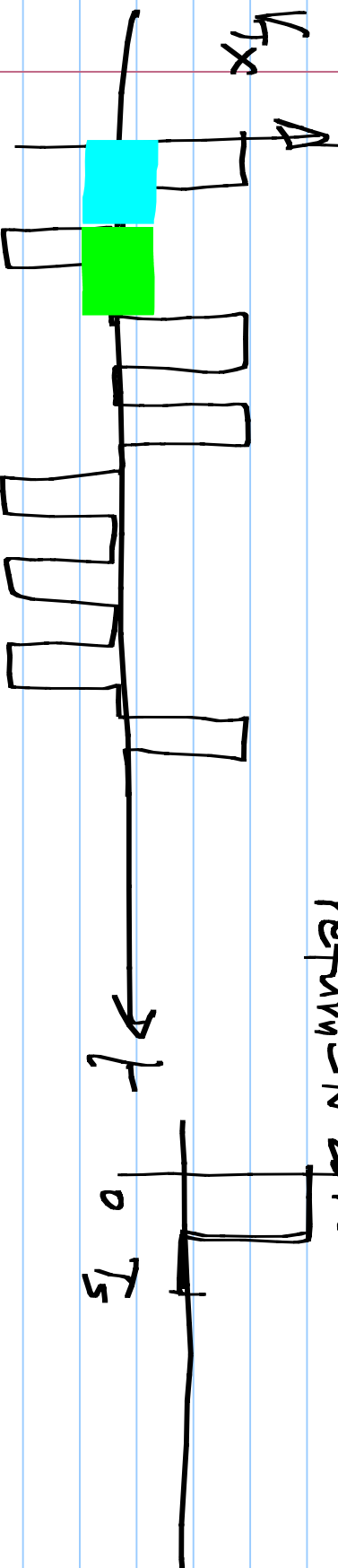
$$\sum a_k p(t - kT_s)$$

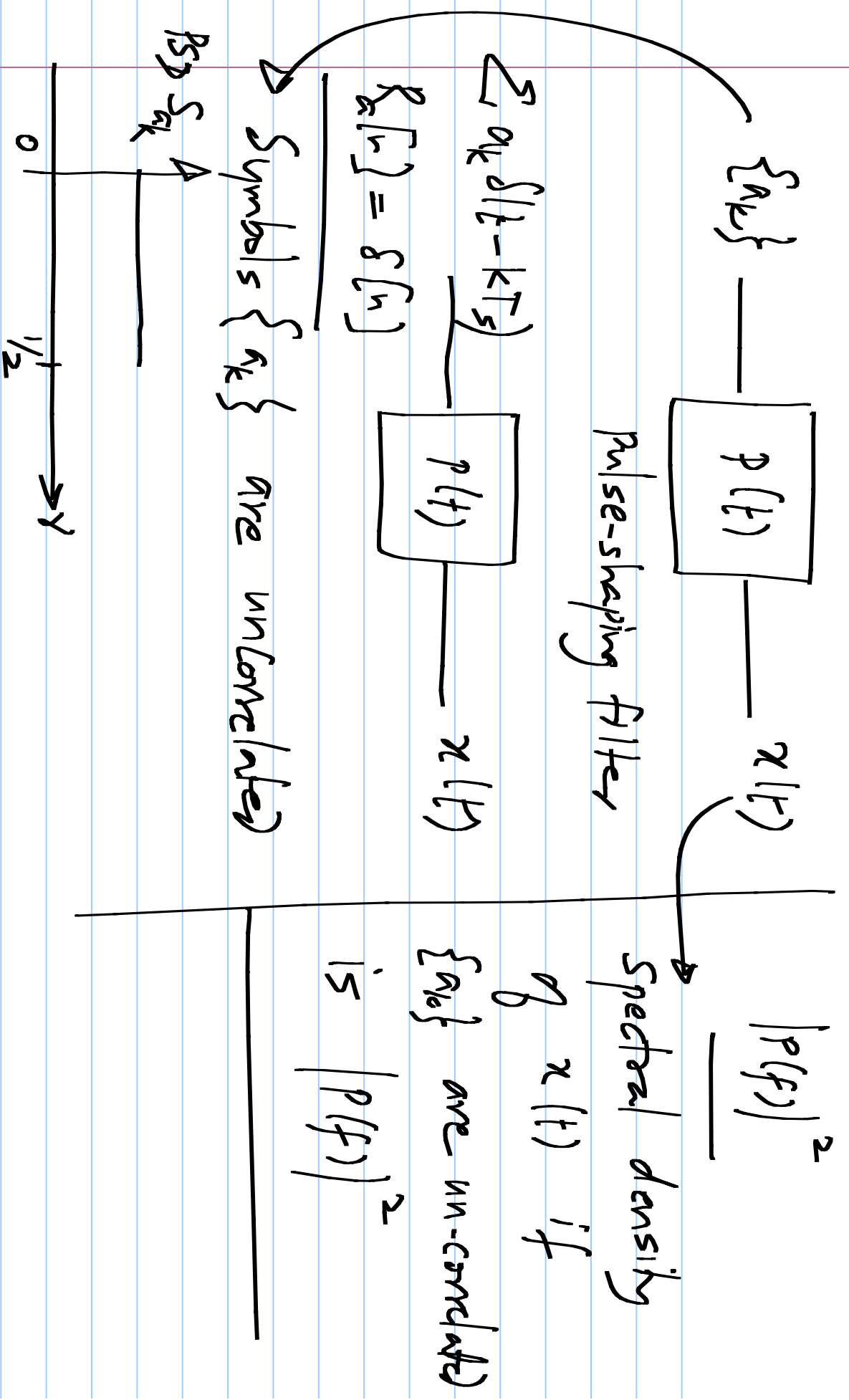


return-to-zero



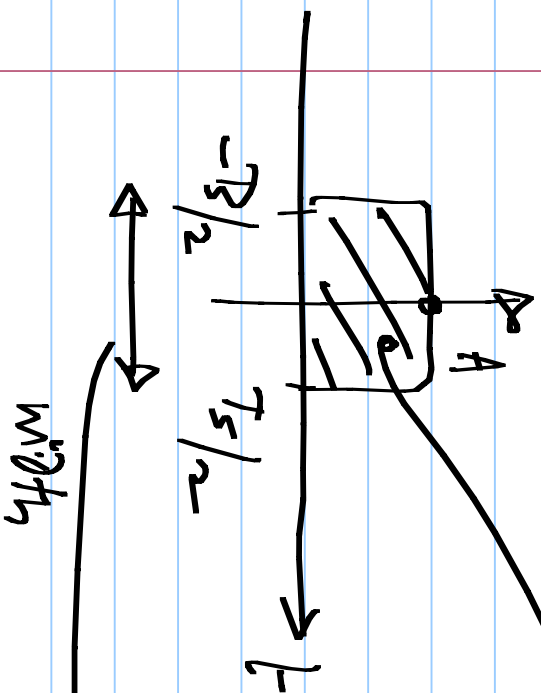
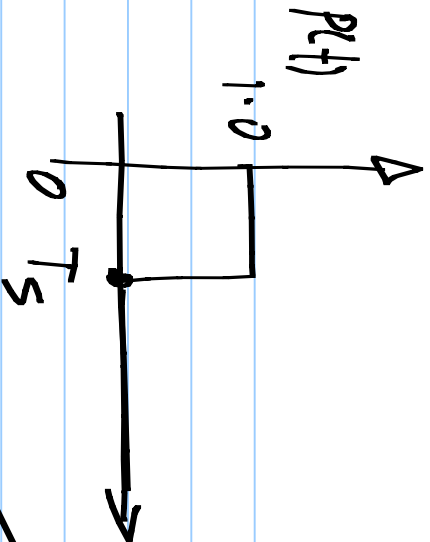
@ rate  $\frac{1}{T_s}$





Sketch  $|P(f)|^2$

$$\text{sinc}(x) = \frac{\sin(\pi x)}{\pi x}$$



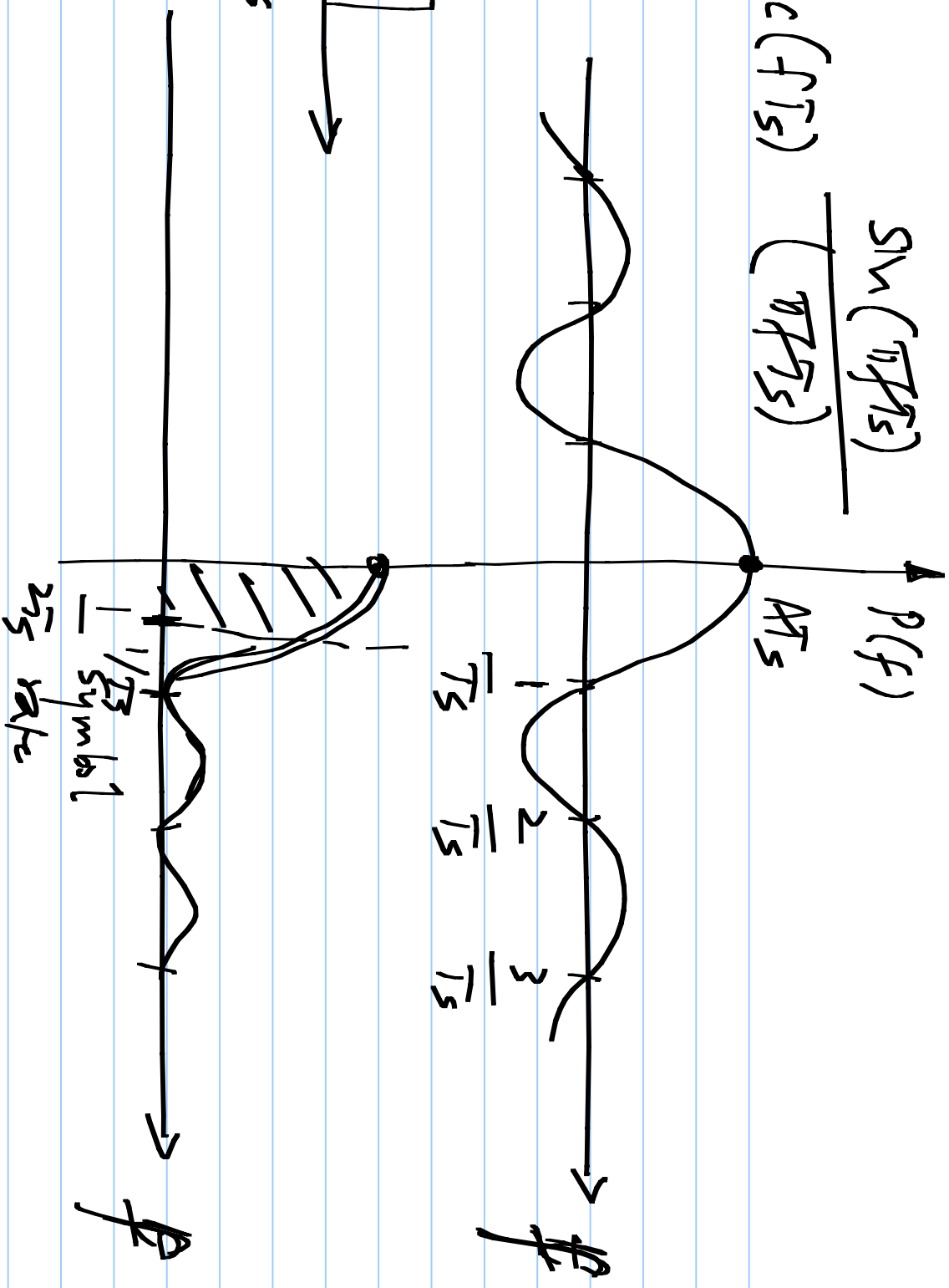
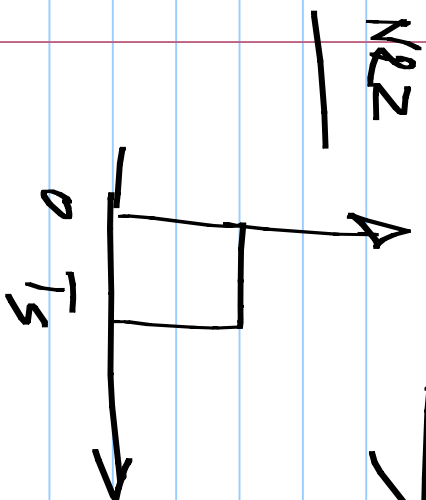
area

$$A \cdot T_s \cdot \text{sinc}(f \cdot T_s)$$

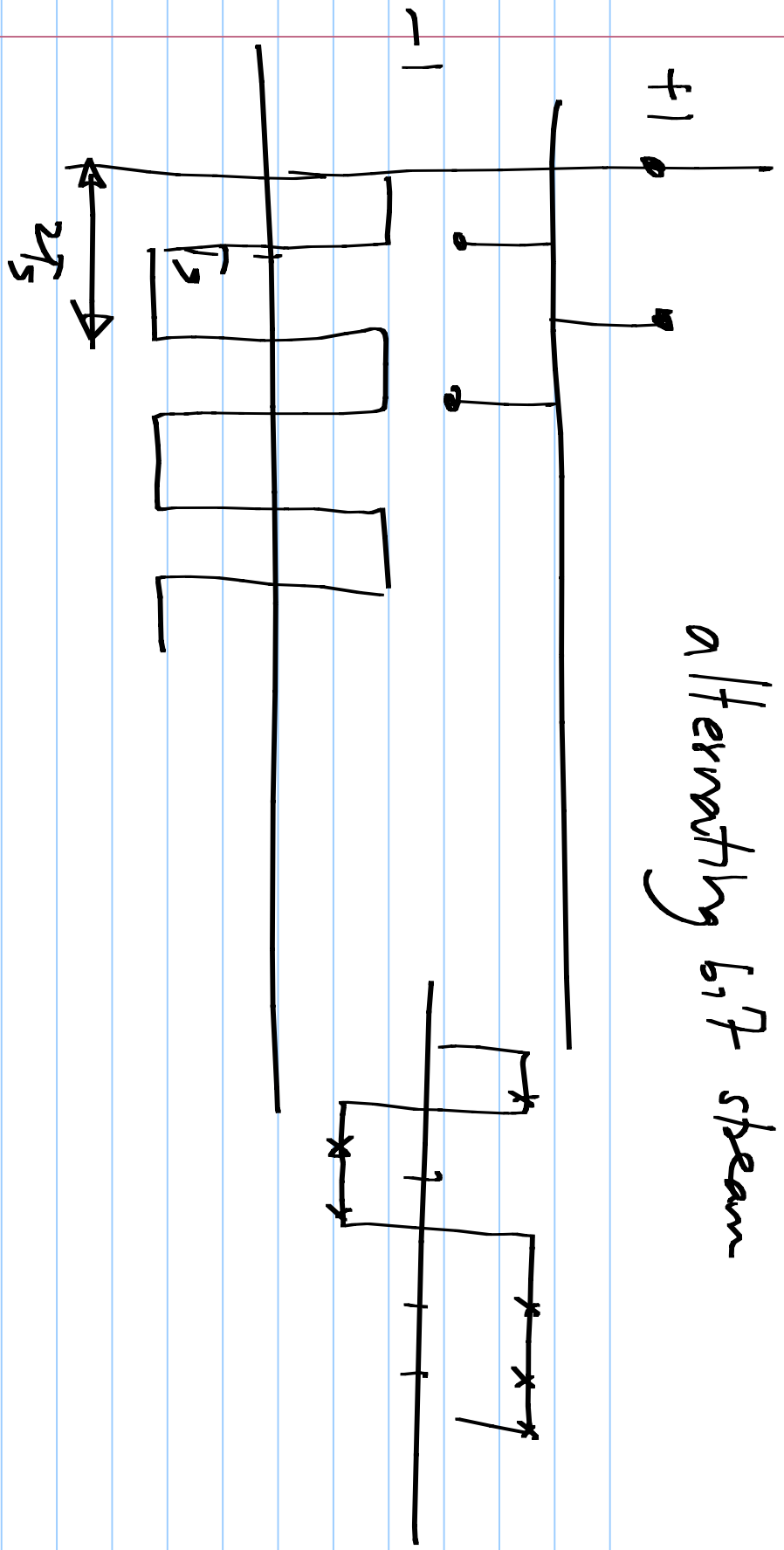
zero @

integer multiples of  $fTs$

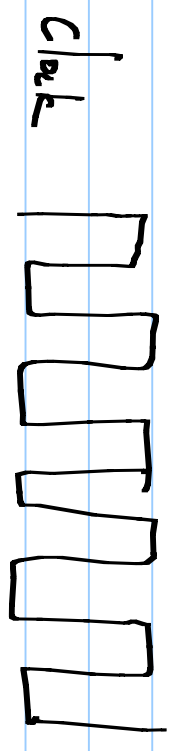
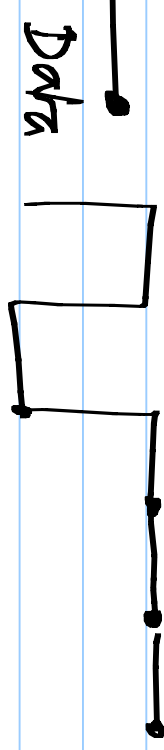
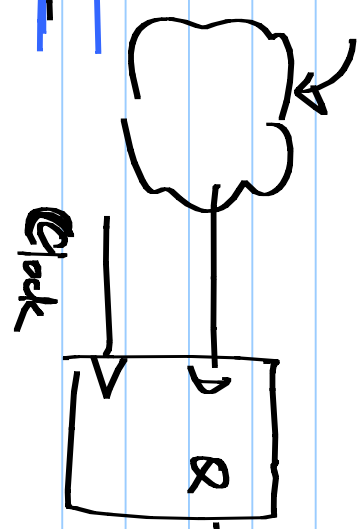
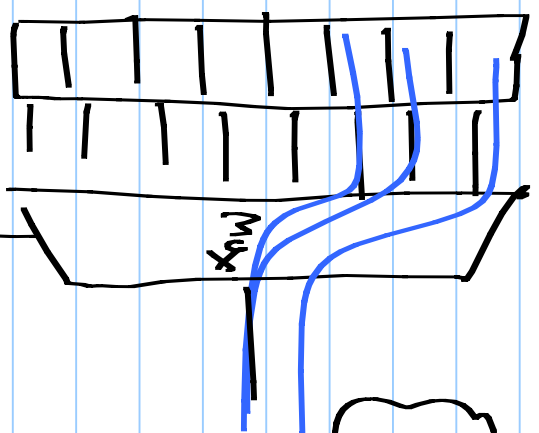
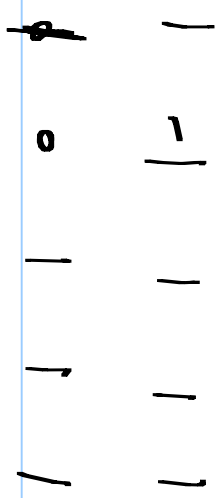
$$A T_s \cdot \text{sinc}(f T_s) \frac{\sin(\pi f T_s)}{(\pi f T_s)}$$



alternating 6,7 stream



$$\{a_k\} \longrightarrow \sum a_k p(t - kT_s)$$



Transmitter: Data (rectangular  $p(t)$ )

Clock @  $f_3$

