ISS numerical No. 5

1) See the Google sheet ... pretty standard formulae ...

$$a[n] = \frac{1}{\Omega}\sum_{\omega=1}^{\Omega} \xi_\omega[n]$$

2) $$D[n] = \frac{1}{\Omega}\sum_{\omega=1}^{\Omega}\left(\xi[n] - a[n]\right)^2$$

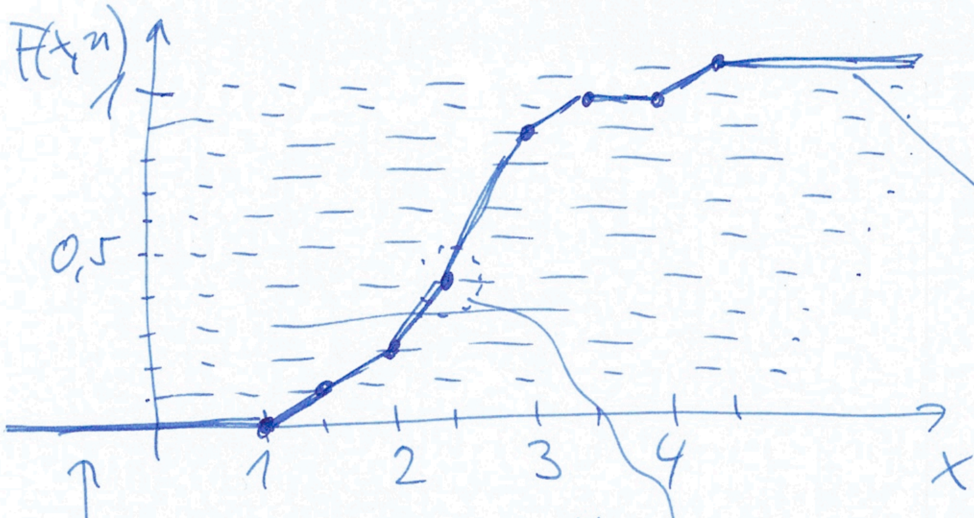
3) $$\sigma[n] = \sqrt{D[n]}$$

4) If the signal is staciouary, the values of parameters are the same.

$$a[7] = a[5], \quad D[7] = D[5], \quad \sigma[7] = \sigma[5]$$

5) Counting the values "smaller than x" (remember the definition of CPDF...)

x	1	1,5	2	2,5	3	3,5	4	4,5
count	0	1	2	4	8	9	9	10
$F(x,n) = \frac{\text{count}}{\Omega}$	0	0,1	0,2	0,4	0,8	0,9	0,9	1,0



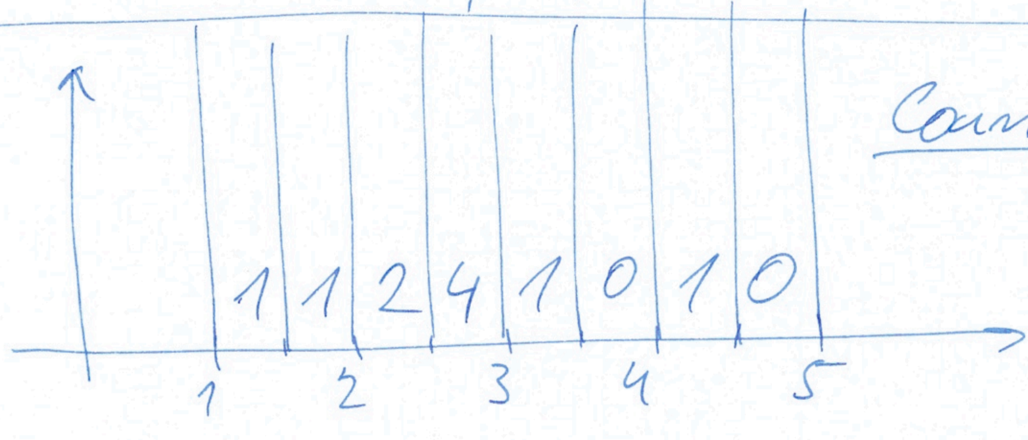
everything smaller than 4,5 ... => are

nothing smaller than 1 => zero

6

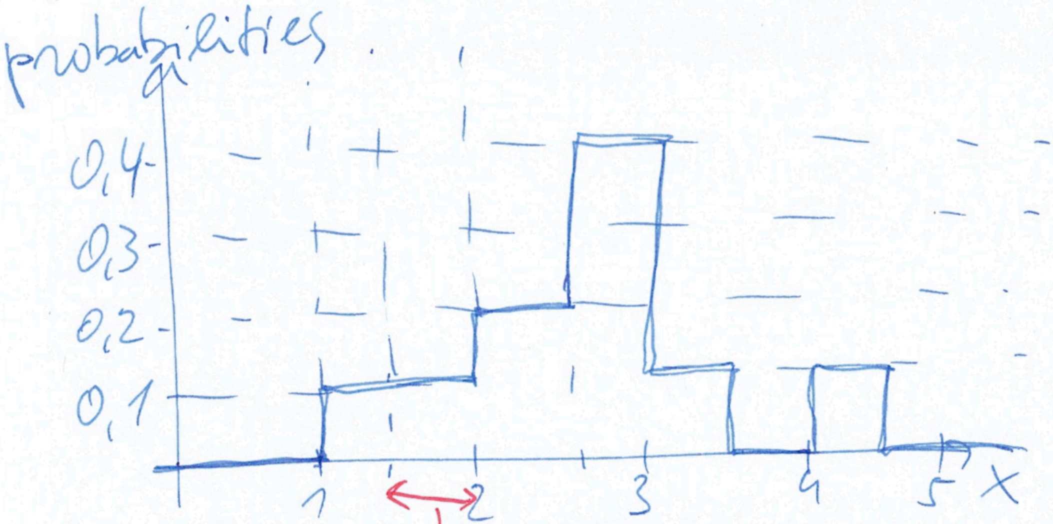
$$P\{\xi[5] \geq 2{,}5\} = 1 - P\{\xi[n] < 2{,}5\} = 1 - F(2{,}5;5) = 1 - 0{,}4 = \underline{\underline{0{,}6}}$$

7

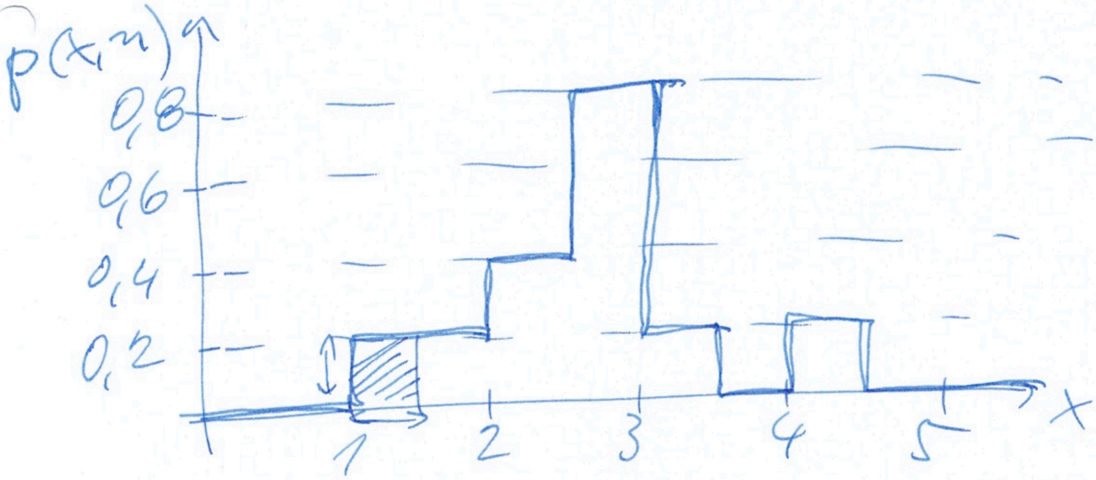


Counts

8 Probabilities: divide by the number of realizations! By 10!



9 For PDF you need to divide by the width of the interval: 0,5.



10 just compute the surface under the curve ...

$$0{,}2\cdot 0{,}5 + 0{,}2\cdot 0{,}5 + \dots =$$

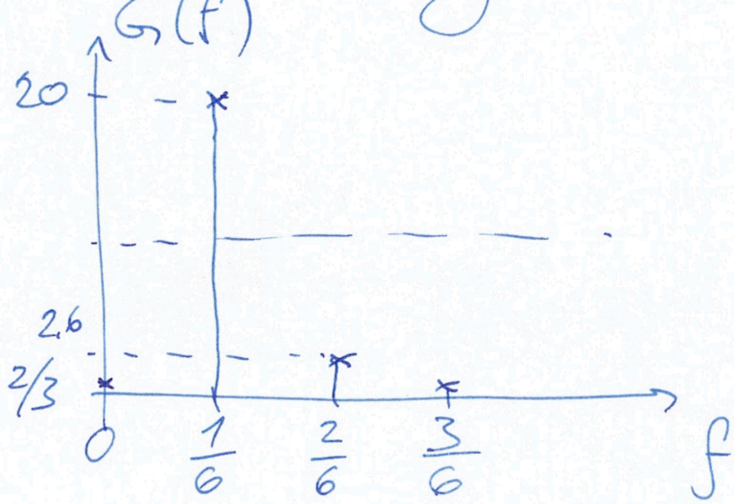
$$= (0{,}2+0{,}2+0{,}4+0{,}8+0{,}2+0{,}2)\cdot 0{,}5 =$$

$$= 2\cdot 0{,}5 = \underline{1}$$ ok!

11 etc - see Google sheets!

to 21

22 Converting k to normalized freq. - just division by N.



$\frac{4}{6} = \frac{2}{3}$

$\frac{120}{6} = 20$

$\frac{16}{6} = 2{,}6$

23 $f = \frac{1}{6}$.

24 The signal seems to have period $N = 8$

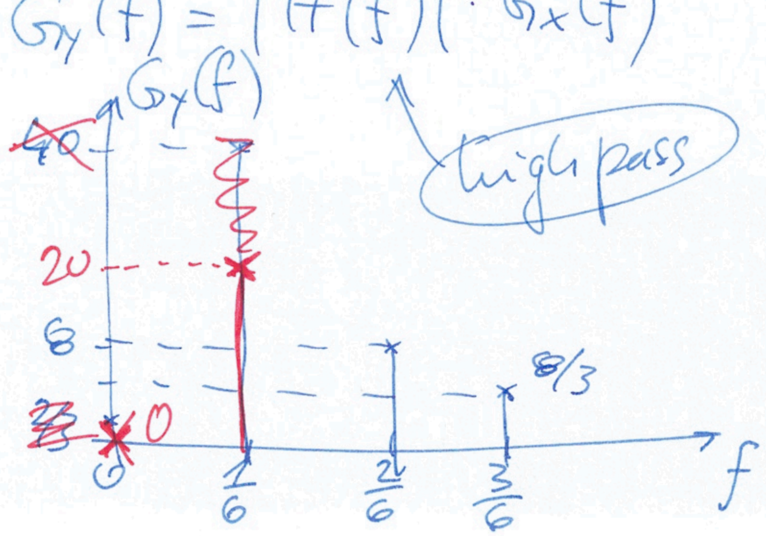
$\underbrace{2 \quad 4 \quad 2 \quad 0 \quad -2 \quad -4 \mid -2 \quad 0}$

So that its peak should be at $f = \frac{1}{N} = \frac{1}{8}$. We don't have resolution to see it properly but it's not too far from $\frac{1}{6}$.

---

25 $G_Y(f) = |H(f)|^2 \cdot G_X(f)$

high pass



0. $\frac{2}{3} \to \cancel{\frac{2}{3}}\ 0$

1. $20 \to \cancel{40}\ 20$

3. $2{,}6 \to 8$

4. $\frac{2}{3} \to \frac{8}{3}$

Maximums has the same position.