Seminar 3

(1) $s_0(t) = -6$

$s_1(t) = -2$

$s_2(t) = 2$

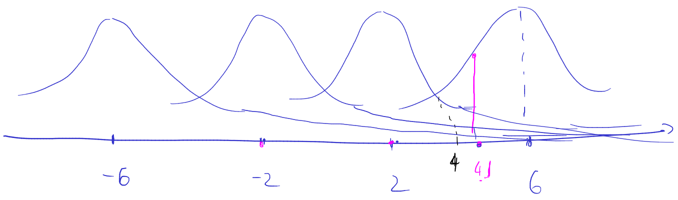
$s_3(t) = 6$

$\mathcal{N}(\mu = 0, \sigma^2)$

r : 4.1, 6.6, −5.2, 1.1, 0.3, −1.5, 7, −7, 4.4

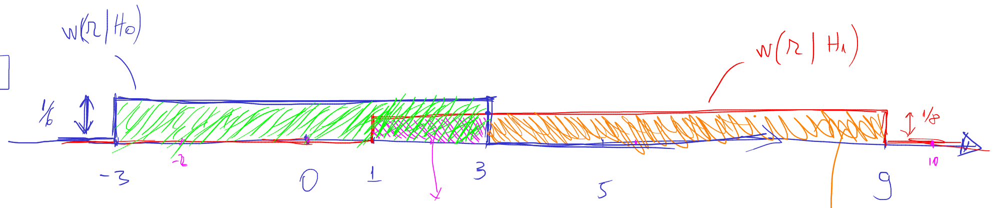
$\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow$

6 6 −6 2 2 −2 6 −6 6 s-a transmis



(2) $H_0: s_0(t) = 0$ $\qquad U[-3,3]$

$H_1: s_1(t) = 5$ $\qquad U[-4,4]$

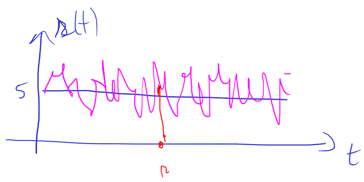


$P_{pierdere} = 2 \cdot \frac{1}{8} = 0.25 = 25\%$

$P_{det. corecte} = \frac{6}{8}$

$r = s(t) + zgomot$

$= 5 + U[-4,4] \to (1,9)$



Răspuns:

$R_0 = [-3, 3]$

$R_1 = (3, 9]$

Indecizie în rest $\left([9, \infty) \cup [-\infty, -3) \right)$

b). $P(D_0 | H_0) = P(r \in R_0 | H_0) = 1 = \int_{-3}^{3} w(r|H_0)\,dr$ $\qquad \cdot P(H_0)$

$P(D_1 | H_0) = P(r \in R_1 | H_0) = \int_3^9 w(r|H_0) = 0$ $\qquad \cdot P(H_0)$

$r \in (3,9)$

$P(D_0 | H_1) = P(r \in (-3,3) | H_1) = \int_{-3}^{3} w(r|H_1)\,dr = 0.25$ $\qquad \cdot P(H_1)$

$P(D_1 | H_1) = P(r \in (3,9) | H_1) = \int_3^9 w(r|H_1)\,dr = 0.75$ $\qquad \cdot P(H_1)$

(3) $H_0: s_0(t) = -2$

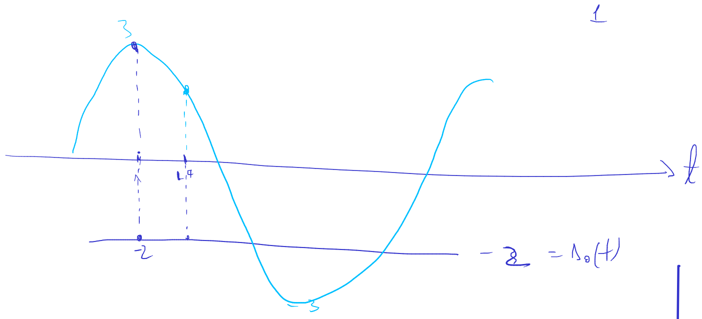
$H_1: s_1(t) = 3 \cdot \sin\left(2\pi \frac{1}{4} t\right)$

$\mathcal{N}\left(\mu = 0, \sigma^2 = 2\right)$

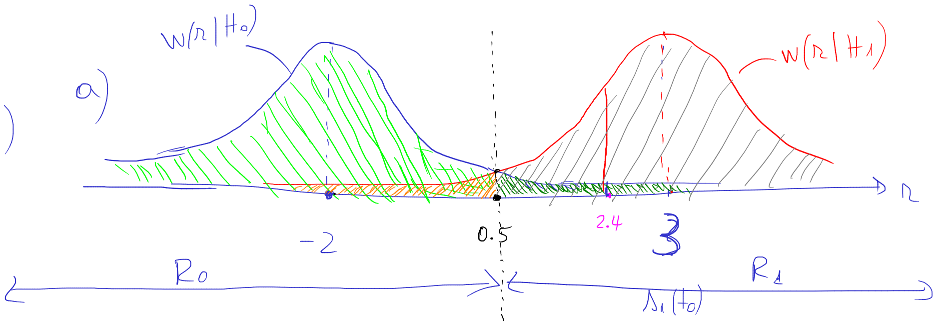
$r: t_0 = 1$

$r = 2.4 = r(t_0)$

$s_1(t_0) = 3\sin\left(2\pi \cdot \frac{1}{4} \cdot 1\right) = 3\underbrace{\sin\left(\frac{\pi}{2}\right)}_{1} = 3$



a)



b): $\boxed{ML}$: $r = 2.4 \Rightarrow D_1$

c). ML: $R_0 = [-\infty, 0.5]$

$R_1 = (0.5, \infty)$

d). ML: $\underset{\text{rej. corectă}}{P(D_0 | H_0)} = P(r \in (-\infty, 0.5) | H_0) = \int_{-\infty}^{0.5} w(r|H_0)\,dr = F(0.5) - \underbrace{F(-\infty)}_{0} =$

$= \frac{1}{2}\left(1 + \operatorname{erf}\left(\frac{0.5 + 2}{\sqrt{2}\cdot\sqrt{2}}\right)\right) = 0.96$ $\quad (\cdot P(H_0))$

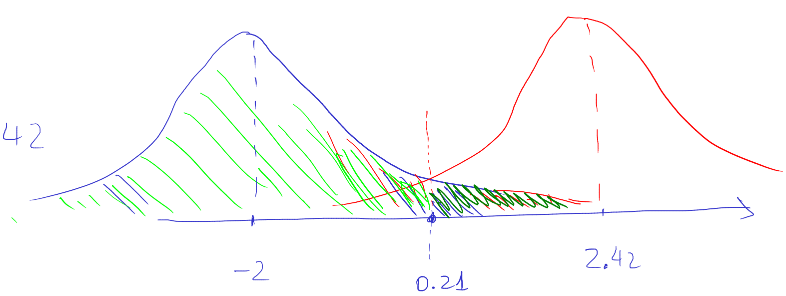
$\underset{\text{alarmă falsă}}{P(D_1 | H_0)} = \int_{0.5}^{\infty} w(r|H_0)\,dr = 0.04$ $\quad (\cdot P(H_0))$

$\underset{\text{pierdere}}{P(D_0 | H_1)} = \int_{-\infty}^{0.5} w(r|H_1)\,dr = F(0.5) - \underbrace{F(-\infty)}_{0} = F(0.5) = \frac{1}{2}\left(1 + \operatorname{erf}\left(\frac{0.5 - 3}{\sqrt{2}\cdot\sqrt{2}}\right)\right) = 0.04$ $\quad (\cdot P(H_1))$

$\underset{\text{det. corectă}}{P(D_1 | H_1)} = \int_{0.5}^{\infty} w(r|H_1)\,dr = \underbrace{F(\infty)}_{1} - \underbrace{F(0.5)}_{0.04} = 0.96$ $\quad (\cdot P(H_1))$

e). $t_0 = 1.4$

$s_1(t_0) = 3 \cdot \sin\left(2\pi \frac{1}{4} \cdot 1.4\right) = 2.42$



$P(D_0 | H_0) = \int_{-\infty}^{0.21} w(r|H_0)$

$P(D_1 | H_0) = \int_{0.21}^{\infty} w(r|H_0)$