Test 2 - rezolvare

1. a) setul este consistent $\Rightarrow$ eroarea = 0

b) $\frac{2}{10}$.

2. $H[2+,3-]$ ☐ $H[10+,5-]$

$\frac{2}{5}$ ↑ $\frac{5}{15}$

$\frac{6}{15}$ ↑ $\frac{5}{15}$

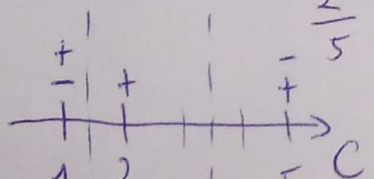
3. $[3+,5-]$ A (0: $[1+,2-]$, 1: $[2+,3-]$) > $[3+,5-]$ B (0: $[2+,1-]$, 1: $[1+,4-]$)

$\Rightarrow H_{0|A} > H_{0|B}$.

= , >

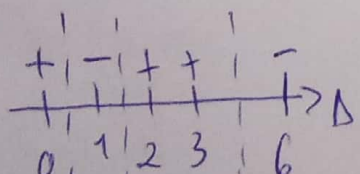
$\frac{5}{8}$ $H[2+,3-]$ ☐ $\frac{5}{8}$ $H[1+,4-]$

$\frac{2}{5}$ ☐ $\frac{1}{5}$

4. a) 

$\Rightarrow$ 2 praguri pt. C

1.5 3.5



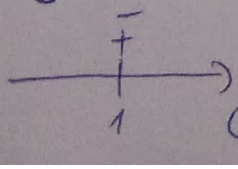
$\Rightarrow$ 3 praguri pt. Δ

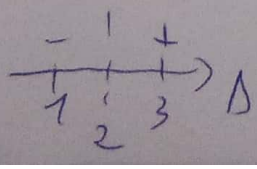
0.5 1.5 4.5

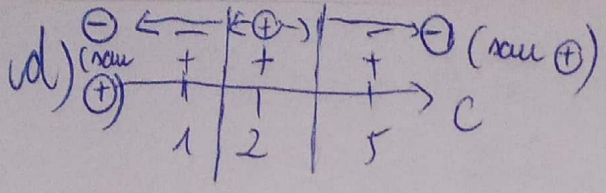
b) (A), (B), (C : 1.5), (C : 3.5), (Δ : 0.5), (Δ : 1.5), (Δ : 4.5)

c) i) H - minim $\Rightarrow$ B - rădăcina

ii) (A), (Δ : 2)





d) 

C=0 va fi clasificată după convenția impusă pe $(-\infty, 1.5)$: ⊖.

5. 1) antrenare

A	B	Y
1	0	1
1	1	1

[2+,0-]

validare

A	B	Y
0	0	0

$\rightarrow er_1 = 1.$

2) antrenare

A	B	Y
0	0	0
1	1	1

[1+,1-]

A

0 / 1

[0+,1-] H=0 — [1+,0-] H=0

H=0

$\Rightarrow$ A rămâne

validare

A	B	Y
1	0	1

$\rightarrow er_2 = 0$

3) antrenare

A	B	Y
0	0	0
1	0	1

[1+,1-]

A

0 / 1

[0+,1-] H=0 — [1+,0-] H=0

H=0

$\Rightarrow$ A rămâne

validare

A	B	Y
1	1	1

$\rightarrow er_3 = 0.$

$\rightarrow er_{CVLOO} = \frac{er_1 + er_2 + er_3}{3} = \boxed{\frac{1}{3}}$.

6. a) $P(A=0 \mid Y=1) \overset{MLE}{=} \frac{1}{3}$

b) — " — $\overset{Laplace}{=} \frac{1+1}{3+\underbrace{|Val(A)|}_{3}} = \frac{2}{6} = \frac{1}{3}$.

7. a) $\overset{MLE}{\Rightarrow} Y: \begin{pmatrix} 0 & 1 & 2 \\ \frac{1}{5} & \frac{2}{5} & \frac{2}{5} \end{pmatrix}$

$Y=0$:

A	B	Y
1	0	0

MLE ↙ MLE ↘

$A: \begin{pmatrix} 0 & 1 & 2 \\ 0 & 1 & 0 \end{pmatrix}$ $B: \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

$Y=1$:

A	B	Y
1	1	1
0	1	1

MLE ↙ MLE ↘

$A: \begin{pmatrix} 0 & 1 & 2 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$ $B: \begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$

$Y=2$:

A	B	Y
1	1	2
2	1	2

MLE ↙ MLE ↘

$A: \begin{pmatrix} 0 & 1 & 2 \\ 0 & \frac{1}{2} & \frac{1}{2} \end{pmatrix}$ $B: \begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$

b) 11 estimări

c) i) $y_{MAP} = \underset{y \in \{0,1,2\}}{\operatorname{argmax}} P(Y=y \mid A=0, B=0)$

FB $= \underset{y \in \{0,1,2\}}{\operatorname{argmax}} \frac{P(A=0, B=0 \mid Y=y) P(Y=y)}{P(A=0, B=0)}$ ct > 0

$= \underset{y \in \{0,1,2\}}{\operatorname{argmax}} \underbrace{P(A=0, B=0 \mid Y=y) P(Y=y)}_{r_y} \overset{not.}{=} y_{JB}$

ii) $r_0 = P(A=0, B=0 \mid Y=0) P(Y=0) = 0 \cdot \frac{1}{5} = 0$

$r_1 = P(A=0, B=0 \mid Y=1) P(Y=1) = 0 \cdot \frac{2}{5} = 0$

$r_2 = P(A=0, B=0 \mid Y=2) P(Y=2) = 0 \cdot \frac{2}{5} = 0$

Convenție: când r-urile sunt egale, alegem eticheta cea mai mică numeric.

$\Rightarrow$ 0.

iii) 0 SAU $\frac{0}{0+0+0}$??? $= \frac{r_0}{r_0+r_1+r_2}$

Ilustrată regula lui Laplace.

8. a) Bayes Naiv (eroare la validare minimă)

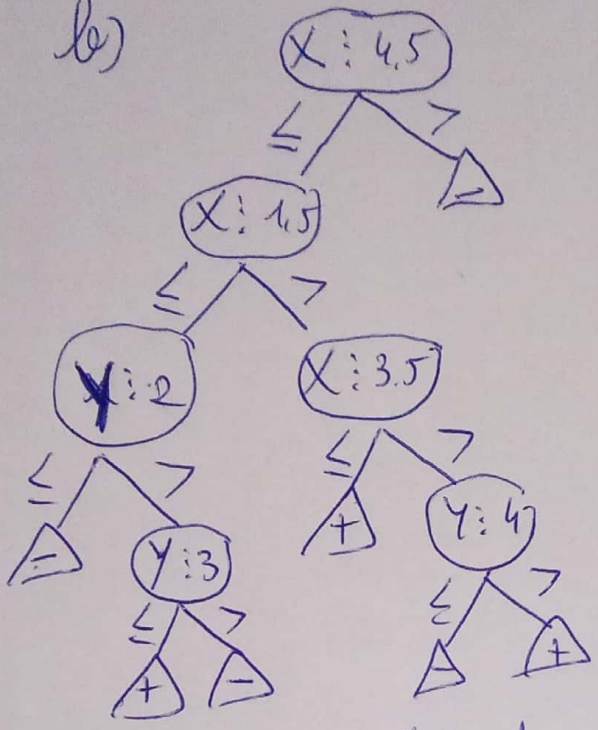
b) ID3: overfitting

ID3 cu index Gini: underfitting

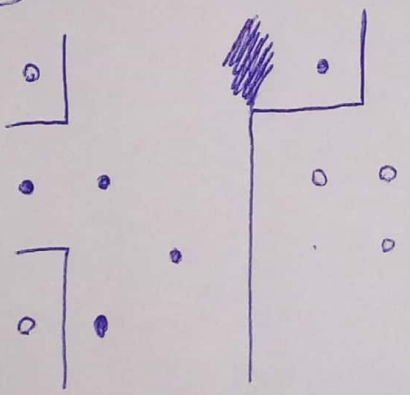
c) pruning

9. a) 7

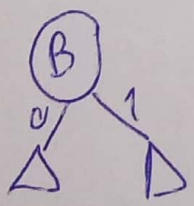
b)



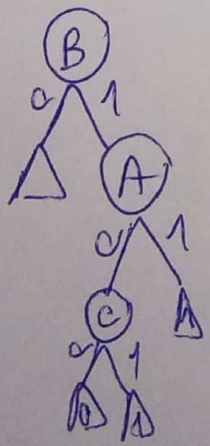
c)



10. a)



b)



c) testul de independență χ^2.

5]