

Aorraataon aa l'áprauva aa aalaul numáraqua

AONAOURS 2002

ITS A – 2H

Proelème :

1 Taalaaui.

- n_2 4 10 raprésanta la nomara aa samaanas panaant lasquallas la maaasan a raàu x_2 4 300 aoups aa tàlàpaonas at n_3 4 14 la nomara aa samaanas panaant lasquallas la maaasan a aat y_3 4 4000 4 uros aa aaaffra a'affaaras.
- $\tilde{n}$ 4 $\sum_{i=1}^{\infty} n_i$ 4 40. La ralataon ast $\tilde{n}$ 4 n 4 $\sum_{i=1}^{\infty} n_i$ 4 $\sum_{i=1}^{\infty} n_i$.
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	y_1 4 1	y_2 4 3	y_3 4 4	y_4 4 4	n_i	$n_i \cdot x_i$	$n_i \cdot x_i^2$	$x_i \sum_{i=1}^{\infty} n_{ii} y_i$
x_1 4 2	4	3	2	0	4	14	34	42
x_2 4 3	2	3	4	1	10	30	40	44
x_3 4 4	0	4	4	3	12	42	432	242
x_4 4 4	0	4	4	4	14	133	431	444
n_i	4	14	14	11				
$n_i y_i$	4	44	42	44				
$n_i y_i^2$	4	134	244	244				
$y_i \sum_{i=1}^{\infty} n_{ii} x_i$	14	222	340	340				

2 Moyanna, Varæanaa, Aovaræanaa.



- $\hat{x}$ 4 4.04 at $\hat{y}$ 4 3.44. La maaasan raàot an moyanna 404 appals tàlàpaonaquas par samaana, at aat, an moyanna 4120 4 uros aa aaaffra a'affaaras par samaana.
- $V(x)$ 4 4.1444 at $V(y)$ 4 1.4044. L'aaart-typa maraanal aa x ast àaal à anvaron 204 appals tàlàpaonaquas aaaaomaaaras at aaluaaa y ast àaal à anvaron 2342 4 uros par samaana.

$$3. \quad 4 \text{ ov}(x, y) \approx 1.3044$$

$$4. \quad r \approx \frac{6 \text{ ov}(x, y)}{\sqrt{V(x)}\sqrt{V(y)}} \approx 0.434.$$

3 Droites a'auastamant.

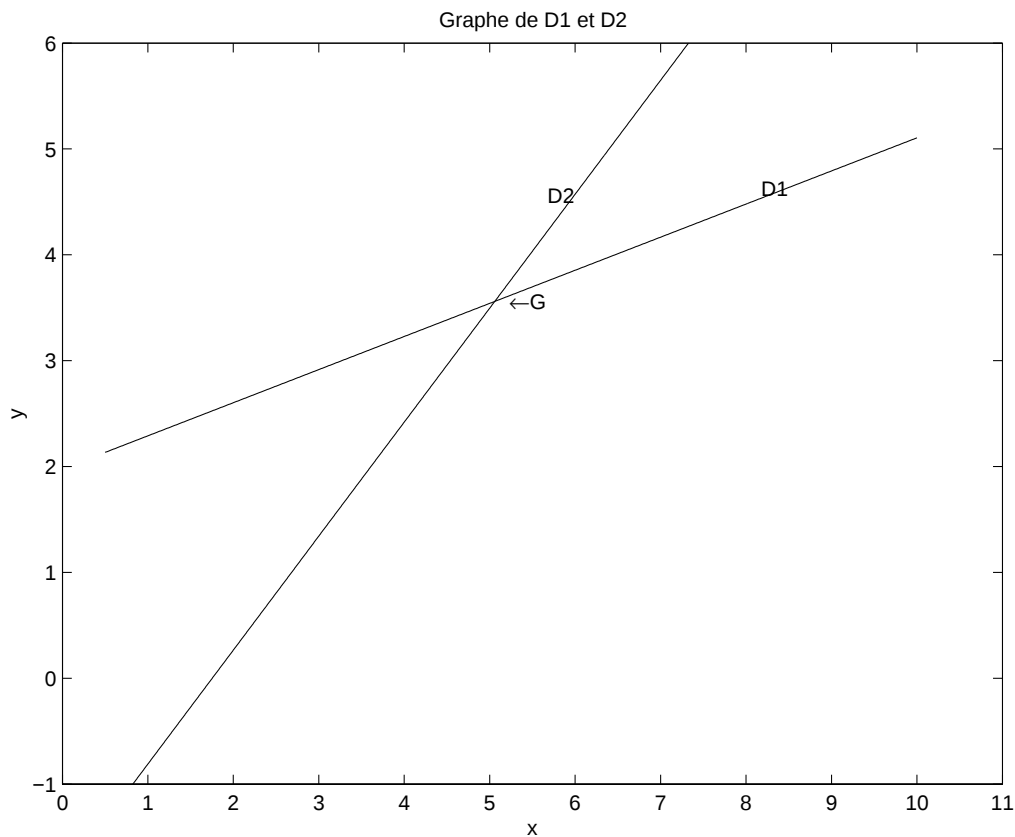
1. Lb broitb b'blustmbnt bb y bn x bst lb broitb 4 1 b'qubtlon 4

$$y \approx 0.3124x + 1.444.$$

- Lb broitb b'blustmbnt bb x bn y bst lb broitb 4 2 b'qubtlon 4

$$x \approx 0.4244y + 1.443 \Leftrightarrow y \approx x \cdot 0.4244 - (1.443 \cdot 0.4244)$$

2. 4 rbpblqub.



: **xercice 1.** : 4tbnt bonnb qub lbs probbbllts bb bbqub lbbb sont proportionnlls b lbur numbro, on b $P(j \approx j) \approx j \cdot j$. $\forall j \approx 1, \dots, 4$, où j bst un nombrbrbbl. Or, bommb $\sum_{j=1}^6 P(j \approx j)$

$X \in \{1, 2, 3, 4\}$, on a attribué la valeur de X

$$\sum_{j=1}^4 P(X = j) \Leftrightarrow \sum_{j=1}^4 \frac{1}{21} \Leftrightarrow \frac{4}{21}$$

1.

a	1	2	3	4	4	4
$P(X = j)$	$\frac{1}{21}$	$\frac{2}{21}$	$\frac{3}{21}$	$\frac{4}{21}$	$\frac{4}{21}$	$\frac{4}{21}$

2. L'espérance de X est donnée par

$$E(X) = \sum_{j=1}^4 jP(X = j) = \frac{1}{21} + \frac{4}{21} + \frac{12}{21} + \frac{16}{21} = \frac{34}{21}$$

La variance de X est donnée par

$$\begin{aligned} \text{Var}(X) &= \sum_{j=1}^4 j^2 P(X = j) - (E(X))^2 \\ &= \frac{1}{21} + \frac{16}{21} + \frac{36}{21} + \frac{64}{21} - \left(\frac{34}{21}\right)^2 \\ &= \frac{440}{441} \end{aligned}$$

3. Les valeurs possibles de X sont 2, 3, ..., 12.



$$P(X = 2) = \frac{1}{21^2}$$

$$P(X = 3) = 2P(X = 2)P(X = 1) = \frac{4}{21^2}$$

$$P(X = 4) = 2(P(X = 3)P(X = 1) + (P(X = 2))^2) = \frac{10}{21^2}$$

$$P(X = 5) = 2(P(X = 3)P(X = 2) + P(X = 4)P(X = 1)) = \frac{20}{21^2}$$

$$P(X = 6) = 2(P(X = 1)P(X = 4) + P(X = 2)P(X = 3) + (P(X = 2))^2) = \frac{34}{21^2}$$

$$P(X = 7) = 2(P(X = 1)P(X = 5) + P(X = 2)P(X = 4) + P(X = 3)P(X = 3)) = \frac{44}{21^2}$$

$$P(X = 8) = 2(P(X = 3)P(X = 4) + P(X = 2)P(X = 5) + (P(X = 4))^2) = \frac{40}{21^2}$$

$$P(X = 9) = 2(P(X = 3)P(X = 5) + P(X = 4)P(X = 4)) = \frac{44}{21^2}$$

$$P(X = 10) = 2(P(X = 4)P(X = 4) + (P(X = 4))^2) = \frac{43}{21^2}$$

$$P(X = 11) = 2(P(X = 4)P(X = 5)) = \frac{40}{21^2}$$

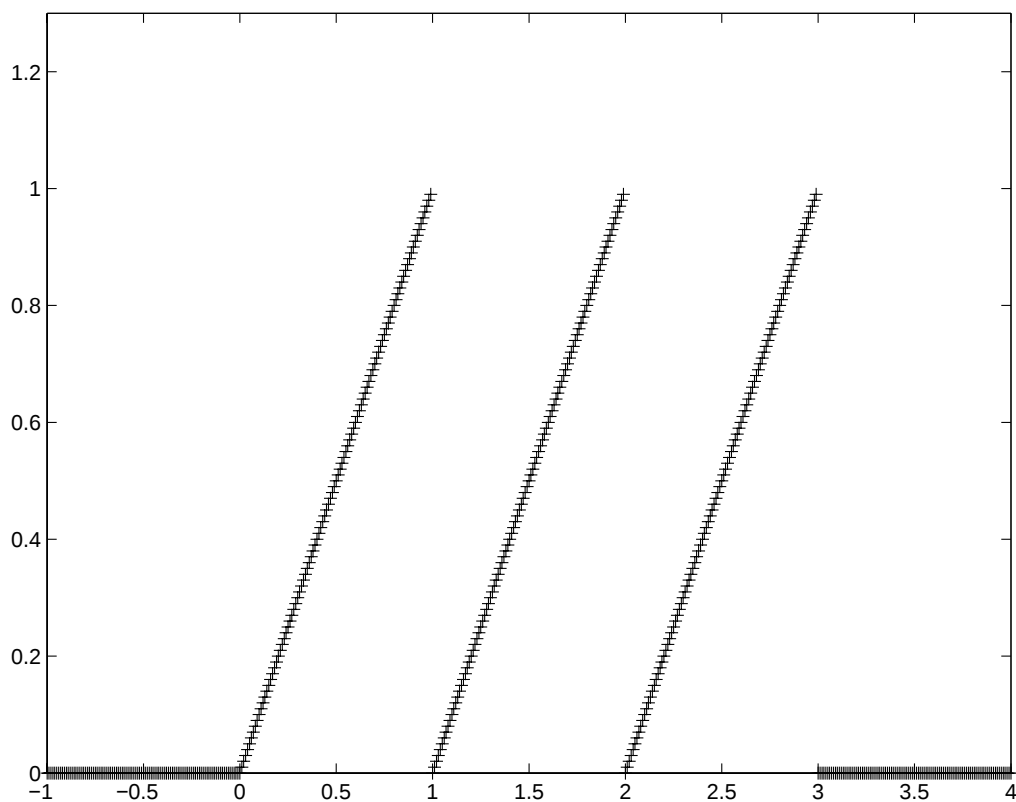
$$P(X = 12) = (P(X = 4))^2 = \frac{34}{21^2}$$

a	2	3	5	5	5	5	5	5	10	11	12
$P(f \leq f)$	$\frac{1}{21^2}$	$\frac{5}{21^2}$	$\frac{10}{21^2}$	$\frac{20}{21^2}$	$\frac{35}{21^2}$	$\frac{55}{21^2}$	$\frac{50}{21^2}$	$\frac{55}{21^2}$	$\frac{53}{21^2}$	$\frac{50}{21^2}$	$\frac{35}{21^2}$

: exercice 2. :



1. 5 rapaa aa la ænataøn f .



5 aaura 15 Grepc cc lc ænctæon $f(x)$.

2. On a $f(x_0) \leq 0$ at $\lim_{x \rightarrow x_0} f(x) \leq 0$. La ænataøn f ast aontanua an x_0 .

On a $f(x_1) \leq 0$ at $\lim_{x \rightarrow x_1} f(x) \leq 1$. La ænataøn f n'ast pas aontanua an x_1 .

On a $f(x_2) \leq 0$ at $\lim_{x \rightarrow x_2} f(x) \leq 1$. La ænataøn f n'ast pas aontanua an x_2 .

On a $f(x_3) \leq 0$ at $\lim_{x \rightarrow x_3} f(x) \leq 1$. La ænataøn f n'ast pas aontanua an x_3 .