CONCOURS D'E NTR EE E N 1ère ANNEE – SESSION D'AOÛT 2018

EPREUVE DE MATHEMATIQUES

Durée 3h00 - Coefficient 4

EXERCISE 1: 5 Marks

I) The evolution of 1998 to 2004 of the average hourly salary of a blue-collar worker is given in the following table:

Number of the year: Xi	1	2	3	4	5	6	7
Hourly salary in FCFA: Yi	1650	1760	1930	2020	2220	2450	2530

1) Represent the group of dots associated with the series doubles (Xi, Yi) in the plan provided with an orthogonal reference mark, as well as the point average G of the cloud. Can one envisage a linear adjustment? To justify your answer 1,5pt

2) Give a truncation of order 2 of the linear coefficient of correlation. What can one conclude? 1pt

3) Determine the equation of the straight regression line of Y according to X. 0,75pt

4) By admitting that this evolution continues, give an estimate of the average hourly salary of such a blue-collar worker in the year 2010. 0,75pt

II) Is a statistical series of average $(n_i; x_i)$, and manpower N and variance V. Show that: $V = (\frac{1}{N}\sum_{i=1}^{p} n_i x_i^2) - x^2$ 1pt

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EXERCISE 2: 5 Marks

I- A cubic die is considered whose two faces carry the figure 1, two figures 2, one figure 3 and the last figure 4.

One launches three times of continuation and one supposes that each face appears with the same probability. That is to say (S) the system of digital equations of unknown factors: $\begin{cases} ax + 2y = 4 \\ bx + y = 2c \end{cases}$

Each parameter a, b, and c is one of numbers 1; 2; 3 and 4; a is determined by the first throw of the die, b by the second and c by the third. Calculate:

1) The P1 probability so that the determinant of the system is null. 1pt

2) The P2 probability so that the system admits a single solution. 1pt

3) The P3 probability so that the system admits the single solution (1; 1) 1pt

4) The P4 probability so that the system admits an infinity of solutions. 1pt

II) One wants to constitute a phone number of 9 digits. Which is the probability of obtaining a comprising number of two digits knowing one repeats five times and the other four times? 1pt

EXERCISE 3: 5 Marks

$(O; \vec{\ }; \vec{\ })$ is an orthonormal reference mark of the plan.

1) That is to say f the IR function in IR defined by $(x) = -\frac{1}{2} + \frac{x}{2\sqrt{x^2+1}}$ and (C) its representative curve.

a) Show that for any t element of $]-\frac{\pi}{2}; \frac{\pi}{2}[$ $(n) = -\frac{1}{2} + \frac{\sin t}{2}$ 0,5pt

b) In deducing the sign of f(x) for any element x from IR. 0,25pt

2) That is to say g the definite IR function in IR by: : $: (x) = -\frac{x}{2} + 1 + \frac{1}{2}\sqrt{x^2+1}$

a) Study the variations of g, then to draw up its statement of the variations. 1,25pt

b) To study the infinite branches of (C), then to define the position of (C) compared to its asymptotes. 0,75pt

C) Build (C). 0,5pt

3) a) Determine the interval K for which g carries out a IR bijection in K. 0,5pt

b) That is to say h the reciprocal bijection of g, (C") its representative curve. Define h. 0,5pt c) Build (C") and to calculate the contact of the points of intersection of (C) with (C") 0,75pt

EXERCICE 4: 5 Marks

Either E a vector space of dimension 2, brought back to a base$(\vec{\ };\vec{\ })$ and M the set of the endomorphism of E admitting in the base a matrix of the form $\begin{pmatrix} & 1- \\ & 1- \end{pmatrix}$ with a and b the reals numbers such as a-b≠1.

1) Ψ is a element of M. Show that there exists a D1 line, which one will express a base $\vec{\ }$ according to a and b such that for any $\vec{\ }$de D_1,$\psi(\boldsymbol{u}^{\vec{\ }}) = \boldsymbol{u}^{\vec{\ }}$. 1,25pt

2) Show that there exists a single real number K ≠1 which one will express according to a and b, such

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as the set, $\{\vec{\vec{\epsilon}} D_1, \psi(\vec{\vec{\ }}) = k\vec{\vec{\ }}\}$ is a line D. Determine a base $\vec{\ }$ of D. 1,25pt

3) Show that $(\vec{\ }; \vec{\ })$ is a base of E and express the matrix of Ψ in this base. 1,25pt

4) Give a requirement and sufficient, bearing on a and b, so that Ψ is not bijective. Then determine the nature and the elements characteristic of Ψ. 1,25pt

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