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|---|---|---|
| **وزارة التربية والتعليم العالي**<br>**المديرية العامة للتربية**<br>**دائرة الامتحانات الرسمية** | **امتحانات الشهادة الثانوية العامة**<br>**فرع: الآداب والإنسانيات** | **دورة العام ٢٠١٧ العاديّة**<br>**الخميس ١٥ حزيران ٢٠١٧** |

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| **عدد المسائل: ثلاث** | **مسابقة في مادة الرياضيات**<br>**المدة: ساعة** | **الاسم:**<br>**الرقم:** |

**ملاحظة:** - يسمح باستعمال آلة حاسبة غير قابلة للبرمجة او اختزان المعلومات او رسم البيانات.
- يستطيع المرشّح الإجابة بالترتيب الذي يناسبه ( دون الالتزام بترتيب المسائل الواردة في المسابقة).

**I- (5 points)**

1) Solve the following system of equations:

$$\begin{cases} x + y = 90\ 000 \\ 0.9x + 0.8y = 76\ 000 \end{cases}$$

2) A uniform consists of a shirt and a pant. This uniform is sold for 90 000 LL. During the sale period, the price of the shirt is decreased by 10 % and that of the pant is decreased by 20 %. The new price of the uniform is then 76 000 LL.

a- Show that the previous text is modeled by the system of equations given above.
b- Determine the price of the shirt and that of the pant before the sale period.

3) a- What is the price of the shirt and that of the pant during the sale period?
b- If Walid has 270 000 LL, what is the greatest number of uniforms that he can buy during the sale period? Justify.

**II- (5 points)**

In a school there are 200 students in the secondary division. These students are distributed as shown in the following table:

| | $1^{st}$ year | $2^{nd}$ year | $3^{rd}$ year | Total |
|---|---|---|---|---|
| Girls | 22 | 35 | 21 | 78 |
| Boys | 46 | 36 | 40 | 122 |
| Total | 68 | 71 | 61 | 200 |

1) A student is randomly selected from these 200 students.
Calculate the probability of each of the following events:

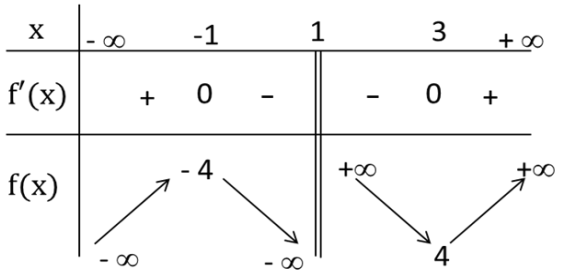
A: « the selected student is a boy in the $1^{st}$ year secondary »;
B: « the selected student is a boy knowing that he is in the $2^{nd}$ year secondary »;
C: « The selected student is in the $3^{rd}$ year secondary or he is a boy».

2) The selected student is not from the $1^{st}$ year secondary. Calculate the probability that this student is a girl.

3) The names of these 200 students are written on cards and placed in a box. Two cards are randomly selected from this box one after another without replacement. Calculate the probability that these two cards have the names of two students in the $3^{rd}$ year secondary.

**III- (10 points)**

The following table represents the variation of a function f. Denote by (C) the representative curve of f in an orthonormal system $\left(O;\vec{i},\vec{j}\right)$.




1) a- Determine the domain of definition of f.

   b- Determine $\lim\limits_{\substack{x\to 1\\ x<1}} f(x)$ and $\lim\limits_{\substack{x\to 1\\ x>1}} f(x)$. Deduce an equation of an asymptote (d) to (C).

   c- Determine $\lim\limits_{x\to -\infty} f(x)$ and $\lim\limits_{x\to +\infty} f(x)$.

2) a- Determine $f(-1)$ and $f'(3)$.

   b- What is the sign of $f'(4)$? Justify your answer.

3) Solve each of the following inequalities:

   a- $f(x)\le 1$.

   b- $f'(x)>0$.

4) Compare $f(1.5)$ and $f(2)$. Justify your answer.

5) The function f is defined as $f(x)=x-1+\dfrac{b}{x-1}$.

   a- Calculate b.

   b- Prove that the straight line (*D*) with equation $y=x-1$ is an asymptote to (*C*).

6) Verify that $f'(0)=-3$, then write an equation of (T), the tangent to (C) at the point with abscissa 0.

7) Draw (d), (D), (T) and (C).

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| QI | Correction | Note |
|---|---|---|
| 1 | x = 40000 and y = 50000 | 1 |
| 2a | $x + y = 90000$ ; $(1 - 0{,}1)x + (1 - 0{,}2)y = 76000$ | $1\frac{1}{2}$ |
| 2b | the initial price of a shirt is 40000 LL ;<br>the initial price of a pant is 50000 LL. | $\frac{1}{2}$ |
| 3a | During the sales: the price of a shirt is 40000×0.9=36000 LL ;<br>the price of a pant is 50000×0.8 = 40000 LL. | 1 |
| 3b | The price of a uniform is : 36000 + 40000 = 76000 L.L<br>270 000 ÷ 76 000 = 3.55<br>Walid can buy 3 uniforms. 270000 > (3×76000 = 218000 L.L ) | 1 |

| QII | Correction | Note |
|---|---|---|
| 1 | $P(A) = \frac{46}{200} = 0.23$ ; $P(B) = P(G/2S) = \frac{36}{71}$ ; $P(C) = \frac{122+61-40}{200} = \frac{143}{200} = 0.715$ | 3 |
| 2 | $P\left(\frac{F}{\overline{1S}}\right) = \frac{p(F \cap \overline{1S})}{p(\overline{1S})} = \frac{56}{132} = \frac{14}{33}$ | 1 |
| 3 | $p\ (the\ names\ of\ 2\ students\ in\ 3rd\ year\ ) = \frac{61}{200} \times \frac{60}{199} = \frac{3660}{39800} = \frac{183}{1990}$ | 1 |

| QIII | Correction | Note |
|---|---|---|
| 1a | $D = ]-\infty; 1[ \cup ]1; +\infty[$ | $\frac{1}{2}$ |
| 1b | $\lim\limits_{\substack{x\to 1\\ x<1}} f(x) = +\infty$ $\lim\limits_{\substack{x\to 1\\ x>1}} f(x) = -\infty$ x = 1 vertical asymptote | $\frac{3}{4}$ |
| 2a | $f(-1) = 4$ ; $f'(3) = 0$ | $\frac{1}{2}$ |
| 2b | $f'(4) < 0\ since\ f'(x) < 0\ for\ x \in ]3; +\infty[$ | $\frac{1}{2}$ |
| 3 | $f(x) \leq 1\ when\ x \in ]\,1\,;\,+\infty\,[$<br>$f'(x) > 0\ when\ x \in ]-1\,;\,1[ \cup ]\,1\,;3\,[$ | 1<br>1 |
| 4 | $f(4) > f(5)\ since\ f\ is\ decreasing\ over\ ]\,3\,;\,+\infty\,[$ | 1 |
| 5a | $f(-1) = 4$ so b = - 4 | 1 |
| 5b | $\lim\limits_{\substack{x\to+\infty\\ x\to-\infty}} [f(x) - (-x+1)] = \lim\limits_{\substack{x\to+\infty\\ x\to-\infty}} \frac{-4}{x-1} = 0$ Hence $y = -x + 1$ is an oblique asymptote to (C). | $\frac{3}{4}$ |
| 5c | $f'(x) = -1 - \frac{4}{(x-1)^2}$<br>$f'(0) = -5.$ | 1 |
| 6 | $y = f'(0)(x - 0) + f(0)\ so\ y = -5x + 5$ | $\frac{1}{2}$ |

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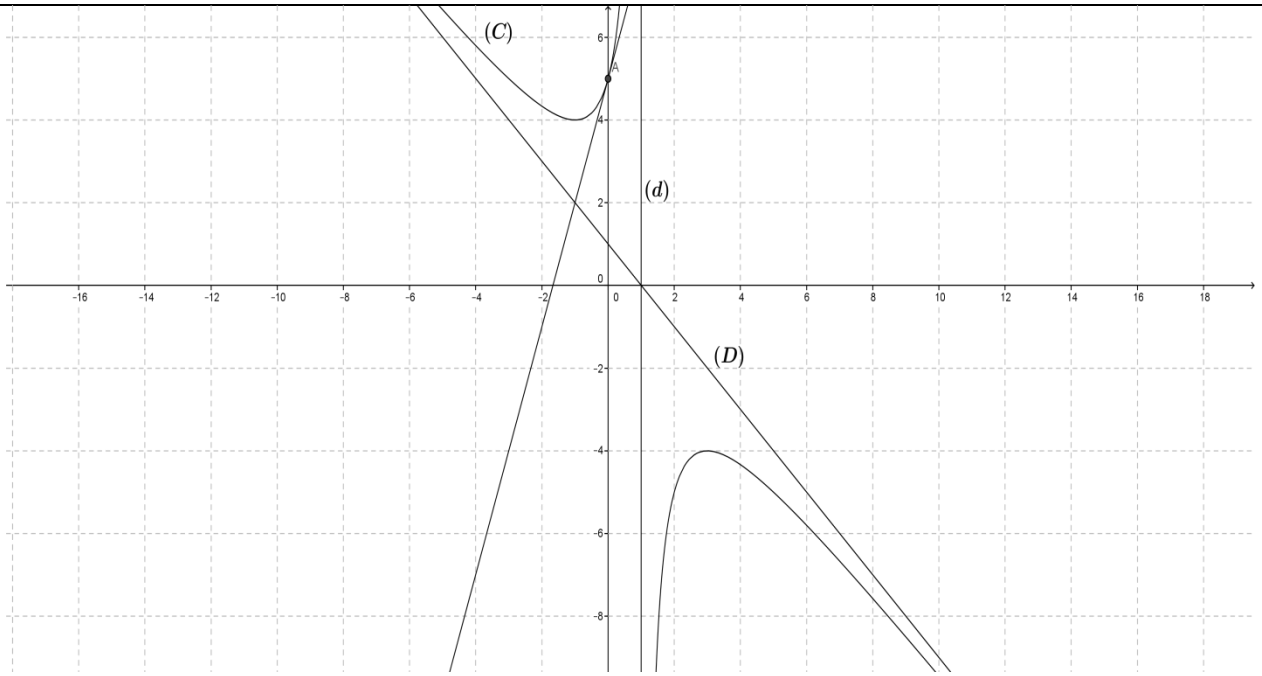
| 7 |  | $1\frac{1}{2}$ |