# COMPLEX NUMBERS

***The complex plane is referred to a direct orthonormal system*** $(O;\vec{u},\vec{v})$**.**

**Let** $z_1$ **and** $z_2$ **be the roots in the set of complex numbers of the equation** $4z^2+(1+i)z+1+i\sqrt{3}=0$ **.**

**1-** $|z_1 z_2| =$

**a)** 0.25 .
**b)** 1 .
**c)** 0.5 .
**d)** none of the above answers is correct .

**2-** An argument of $z_1+z_2$ is

**a)** $\frac{\pi}{4}$.
**b)** $-\frac{3\pi}{4}$.
**c)** $-\frac{3\pi}{16}$.
**d)** $\frac{3\pi}{4}$.

**3-** $\arg(z_1) =$

**a)** $\pi-\arg(z_2)$.
**b)** $\frac{\pi}{6}-\arg(z_2)$
**c)** $\arg(z_2)-\frac{\pi}{3}$.
**d)** $\frac{\pi}{3}-\arg(z_2)$.

**4-** The roots of the equation $4\bar{z}^2-(1+i)\bar{z}+1+i\sqrt{3}=0$ are

**a)** $z_1$ and $z_2$ .
**b)** $\overline{z_1}$ and $\overline{z_2}$ .
**c)** $-\overline{z_1}$ and $-\overline{z_2}$ .
**d)** non of the above answers is correct .

**5-** The number $(1-i)^{14}$ is

**a)** a pure real number .
**b)** a pure imaginary number whose imaginary part is positive .
**c)** a pure imaginary number whose imaginary part is negative .
**d)** non of the above answers is correct .

**6-** Let $\theta$ be an argument of the complex number $(1-\sqrt{3}\,i)^{12}+(4+3i)^{9}$ .

If $z=\dfrac{(1-\sqrt{3}\,i)^{12}+(4+3i)^{9}}{(1+\sqrt{3}i)^{12}+(4-3i)^{9}}$ , then :

**a)** $|z|=1$ and $2\theta$ is an argument of $z$ .
**b)** $|z|=0$ and $2\theta$ is an argument of $z$ .
**c)** $|z|=1$ and $0$ is an argument of $z$ .
**d)** non of the above answers is correct .

$f$ **is the mapping that , to each point** $M$ **of affix** $z\neq 0$ **, associates the point** $M'$ **of affix** $z'=\dfrac{4i}{\bar{z}}$ **.**

**7-** The set of invariant points by $f$ is :

**a)** $\{I(0\,;\,2)\,;\,J(0\,;\,-2)\}$ .
**b)** the set of points of the circle of center $O$ and radius $2$ .
**c)** the set of points of the axis of ordinates .
**d)** the empty set.

**8-** The points $M$ and $M'$ are such that :

**a)** $(OM)$ and $(OM')$ are perpendicular .
**b)** $O$, $M$ and $M'$ are collinear .
**c)** $M$ and $M'$ belong to the circle of center $O$ and radius $2$ .
**d)** $M$ and $M'$ belong to the axis $(O\,;\,\vec{v})$ .

**The students committee in a high school consists of five girls and three boys .**
**Two members of the committee are selected in succession .**

**9-** The probability that the two members selected are of same sex is equal to :

**a)** $\frac{17}{32}$.

**b)** $\frac{13}{28}$ .

**c)** $\frac{13}{14}$ .

**d)** $\frac{15}{32}$.

**10-** The probability that the second member selected is a girl knowing that the first is a boy, is equal to :

**a)** $\frac{5}{7}$ .

**b)** $\frac{4}{7}$ .

**c)** $\frac{15}{56}$ .

**d)** $\frac{3}{7}$ .

**11-** $A$ and $B$ are two events of a certain experiment ,

If $p(\overline{A}) = \frac{5}{8}$ , $p(B) = \frac{1}{2}$ and $p(A \cap \overline{B}) = \frac{1}{4}$ , then $p(B / \overline{A})$ is equal to :

**a)** $\frac{3}{4}$.

**b)** $\frac{1}{4}$ .

**c)** $\frac{3}{8}$ .

**d)** $\frac{3}{5}$.



**Given a box $E$ containing $2$ red balls ,$1$ white ball and $4$ yellow ones ;**

**a box $F$ containing $1$ red balls , $2$ white balls and $3$ yellow ones.**
**We randomly draw $2$ balls from each box .**

**12-** The probability that the $4$ balls have the same color is equal to :

**a)** $\frac{1}{7}$ .

**b)** $\frac{1}{35}$ .

**c)** $\frac{2}{35}$ .

**d)** $0.4$ .

**13-** The probability that only $3$ of the $4$ balls are yellow is equal to :

**a)** $\frac{5}{63}$ .

**b)** $\frac{2}{7}$ .

**c)** $\frac{1}{45}$ .

**d)** non of the above answers is correct .

**Two basket ball teams $\boldsymbol{A}$ and $\boldsymbol{B}$ are to play a series of three games such that the team who wins two games will win the series .**

**We know that , in each game , the probability that team $\boldsymbol{A}$ wins is equal to $\frac{2}{3}$ .**

**14-** The probability that team $\boldsymbol{B}$ will win the series is equal to :

**a)** $\frac{4}{27}$ .

**b)** $\frac{1}{9}$ .

**c)** $\frac{7}{27}$ .

**d)** $\frac{4}{9}$ .

**15-** Knowing that team $\boldsymbol{A}$ won the series , the probability that team $\boldsymbol{B}$ won the first game is equal to :

**a)** $\frac{2}{7}$ .

**b)** $\frac{1}{5}$ .

**c)** $\frac{2}{7}$ .

**d)** $\frac{2}{5}$ .

**16-** The solution set of the inequality $\exp\left(\ell n(4-x^2)\right) \geq 1-2x$ is :

**a)** $[-1\,;3]$ .

**b)** $]-\infty\,;\,-1]\cup[3\,;+\infty[$ .

**c)** $]-2\,;2[$ .

**d)** $[-1\,;2[$ .

**17-** The solution set of the inequality $e^{\frac{1}{x}} > -e^{-\frac{1}{3}}$ is :

**a)** $IR$ .

**b)** $IR-\{0\}$ .

**c)** $[-3\,;0[$ .

**d)** $[-3\,;0]$ .

**18-** The solution set of the equation $e^{4x}-e^{2x}=2$ is :

**a)** $\{-1\,;2\}$.

**b)** $\{\ell n 2\}$.

**c)** $\{\ell n 1\}$.

**d)** $\{\ell n\sqrt{2}\}$.

**19-** The solution set of the inequality $\ell n(4-\sqrt{4-x}) < \ell n 2$ is :

**a)** $[-12\,;4]$ .

**b)** $]-12\,;4[$.

**c)** $]-12\,;0[$.

**d)** non of the previous answers is correct .

**20-** The solution set of the inequality $\ell n(x-1)+\ell n(x-3) \leq 3\ell n 2$ is :

**a)** $]3\,;5]$.

**b)** $[3\,;5[$.

**c)** $]3\,;+\infty[$ .

**d)** $[-3\,;5[$ .

# FUNCTIONS

***The plane is referred to a direct orthonormal system*** $(O\,;\,\vec{i}\,,\,\vec{j}\,)$

**21-** The function $f$ defined on $IR$ by $f(x)=\begin{cases}1-e^{x-1} & if \quad x\le 1\\ -\ell n\,x & if \quad x>1\end{cases}$ is :

**a)** continuous and not differentiable at 1 .
**b)** differentiable and not continuous at 1 .
**c)** continuous and differentiable at 1 .
**d)** neither continuous nor differentiable at 1.

**The function** $h$ **is defined on** $]0\,;\,2[\cup]2\,;\,+\infty[$ **by** $h(x)=\dfrac{\ell n\,x}{x-2}$**.**

**22-** $\lim\limits_{x\to 0^+} h(x)=\ell_1$ and $\lim\limits_{x\to +\infty} h(x)=\ell_2$ where :

**a)** $\ell_1=+\infty$ and $\ell_2=-\infty$ .
**b)** $\ell_1=-\infty$ and $\ell_2=0$ .
**c)** $\ell_1=-\infty$ and $\ell_2=-\infty$ .
**d)** $\ell_1=+\infty$ and $\ell_2=0$ .

**23-** $\lim\limits_{x\to 2^-} h(x)=L_1$ and $\lim\limits_{x\to 2^+} h(x)=L_2$ where :

**a)** $L_1=-\infty$ and $L_2=-\infty$ .
**b)** $L_1=-\infty$ and $L_2=+\infty$ .
**c)** $L_1=-\infty$ and $L_2=0$ .
**d)** $L_1=0$ and $L_2=+\infty$ .

**The function** $g$ **is defined on** $]0\,;\,+\infty[$ **by** $g(x)=x^2\left(\dfrac{3}{2}-\ell n\,x\right)$**.**

**The representative curve** $(C)$ **of** $g$ **cuts the axis of abscissas at a point** $A$**.**

**24-** The tangent to $(C)$ at $A$ cuts the axis of ordinates at the point with ordinate :

**a)** $-e\sqrt{e}$ .
**b)** $e\sqrt{e}$ .
**c)** $e^3$ .
**d)** $e^2$ .

**25-** The tangent to $(C)$ at the point of inflection cuts the axis of abscissas at the point with abscissa :

**a)** $\dfrac{1}{4}$ .
**b)** $-2$ .
**c)** $\dfrac{7}{4}$ .
**d)** $1$.

**The function $f$ is defined on $IR$ by $f(x)=(x+1)e^{-x}$ .**
**Let $(\gamma)$ be the representative curve of $f$ .**

**26-** The tangent to $(\gamma)$ at the point of abscissa $\alpha$ cuts the axis of ordinates at the point of ordinate $\beta=$ :

**a)** $(\alpha^2+1)e^{-\alpha}$ .
**b)** $\alpha^2-e^{-\alpha}$ .
**c)** $(\alpha^2+\alpha+1)e^{-\alpha}$ .
**d)** $\alpha^2 e^{-\alpha}$ .

**27-** Let $S(m)$ be the measure , in units of area , of the area of the domain bounded by $(\gamma)$ , the two axes of coordinates and the straight line of equation $x=m$ where $m>0$ ; $\lim\limits_{m\to+\infty} S(m)=$

**a)** $e$ .
**b)** $1$ .
**c)** $e+1$ .
**d)** $2$ .

**The function $F$ is defined on $]0\,;+\infty[$ by $F(x)=x\ell n x-\ell n x$ .**
**Let $(L)$ be the representative curve of $F$ .**

**28-** The sign of $F(x)$ is such that :

**a)** $F(x)<0$ in $]0\,;1[$ and $F(x)>0$ in $]1\,;+\infty[$ .
**b)** For all $x$ in $]0\,;+\infty[$, $F(x)\geq 0$ .
**c)** $F(x)>0$ in $]0\,;1[$ and $F(x)<0$ in $]1\,;+\infty[$ .
**d)** For all $x$ in $]0\,;+\infty[$, $F(x)\leq 0$ .

**29-** The straight line of equation $y=2x-2$ cuts $(L)$ at the points of respective abscissas :

**a)** $1$ and $e^2$ .
**b)** $2$ and $d=e$ .
**c)** $1$ and $e$ .
**d)** $\sqrt{e}$ and $1$.

**30-** The curve $(L)$ **:**

**a)** does not have any common point with the axis of abscissas .
**b)** cuts the axis of abscissas at the points of abscissas $0$ and $1$ .
**c)** is tangent to the axis of abscissas at the point of abscissa $1$ .
**d)** is tangent to the axis of abscissas at the point of abscissa $e$ .

**31-** $\int_{0}^{\ell n 2} \frac{e^x}{e^x - 3} dx$ is equal to :

**a)** $\ell n 2$ .
**b)** $-\ell n 2$ .
**c)** $-1.5$ .
**d)** non of the above answers is correct .

**32-** $\int_{-1}^{1} \left( 2x + \frac{x+1}{x^2 + 2x + 3} \right) dx$ is equal to :

**a)** $2 + \ell n \sqrt{3}$ .
**b)** $\ell n 3$ .
**c)** $\ell n \sqrt{3}$ .
**d)** $2 + \ell n 3$ .

**33-** $\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \tan^9 x \, dx$ is equal to :

**a)** $0$ .
**b)** $2\left(\sqrt{3}\right)^{10}$ .
**c)** $0.2\left(\sqrt{3}\right)^{10}$ .
**d)** non of the above answers is correct .

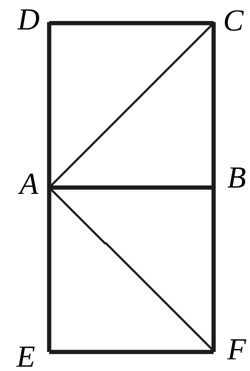
**34-** $f$ is a continuous function defined on $IR$ by $f(x) = \begin{cases} 2x - 2 & if \quad x < 1 \\ \ell n\, x & if \quad x \geq 1 \end{cases}$ ; $\int_{-2}^{e} f(x) dx$ is equal to :

**a)** $8$ .
**b)** $-8$ .
**c)** $-10$ .
**d)** non of the above answers is correct .

**35-** The function $g$ is defined on $]-\infty\, ; 0[$ by $g(x) = \ell n(-x)$ .
An antiderivative $G$ of $g$ is defined on $]-\infty\, ; 0[$ by $G(x) =$ :
**a)** $x \ell n(-x) + x$ .
**b)** $-x \ell n(-x) + x$ .
**c)** $-x \ell n(-x) - x$ .
**d)** $x \ell n(-x) - x$ .

# TRANSFORMATIONS

***The plane is referred to a direct orthonormal system*** $(O\ ;\vec{u}\ ,\ \vec{v}\ )$




**In the figure ,** $ABCD$ **and** $EFBA$ **are two direct squares .**
**Let** $T$ **be the translation of vector** $\overrightarrow{CD}$ **and** $S$ **the similitude of center** $A$ **, ratio** $\sqrt{2}$ **and angle** $\frac{\pi}{4}$ **.**

**36-** The points $T\circ S(B)$ and $S\circ T(B)$ are such that :

**a)** $T\circ S(B)=D$ and $S\circ T(B)=D$

**b)** $T\circ S(B)=A$ and $S\circ T(B)=A$ .

**c)** $T\circ S(B)=D$ and $S\circ T(B)=A$.

**d)** non of the previous answers is correct .

**37-** The points $T\circ S(E)$ and $S\circ T(F)$ are such that :

**a)** $T\circ S(E)=E$ and $S\circ T(F)=C$ .

**b)** $T\circ S(E)=B$ and $S\circ T(F)=F$ .

**c)** $T\circ S(E)=F$ and $S\circ T(F)=E$ .

**d)** $T\circ S(E)=E$ and $S\circ T(F)=F$ .

**38-** The ratio $k$ and the angle $\alpha$ of the similitude $T\circ S$ are :

**a)** $k=\frac{1}{\sqrt{2}}$ and $\alpha=\frac{\pi}{4}$ .

**b)** $k=\sqrt{2}$ and $\alpha=\frac{\pi}{4}$ .

**c)** $k=2$ and $\alpha=-\frac{\pi}{4}$.

**d)** non of the previous answers is correct .

$g$ **is the transformation defined by its complex relation** $z'=(1-\sqrt{3}\,i)\,z+3i$ **.**

**39-** The image by $g$ of a circle of radius $\sqrt{2}$ is a circle of area :

**a)** $2\pi$ *units of area* .

**b)** $4\pi$ *units of area* .

**c)** $8\pi$ *units of area* .

**d)** $4\sqrt{2}\,\pi$ *units of area* .

**40-** If $f=g\circ g\circ g$ , then $f$ is :

**a)** the central symmetry of center $G(0\ ;\sqrt{3})$

**b)** the similitude of center $L(-\sqrt{3}\ ;0)$ , ratio 2 and angle $-\frac{\pi}{2}$ .

**c)** the similitude of center $I(\sqrt{3}\ ;0)$ , ratio 8 and angle $-\frac{\pi}{3}$

**d)** the dilation ( homothecy ) of center $J(\sqrt{3}\ ;0)$ and ratio $-8$ .

Grille de correction

| Question | Réponse | | Question | Réponse |
|---|---|---|---|---|
| 1 | c | | 21 | c |
| 2 | b | | 22 | d |
| 3 | d | | 23 | b |
| 4 | c | | 24 | c |
| 5 | b | | 25 | a |
| 6 | a | | 26 | c |
| 7 | d | | 27 | d |
| 8 | a | | 28 | b |
| 9 | b | | 29 | a |
| 10 | a | | 30 | c |
| 11 | d | | 31 | b |
| 12 | c | | 32 | c |
| 13 | b | | 33 | a |
| 14 | c | | 34 | b |
| 15 | b | | 35 | d |
| 16 | d | | 36 | c |
| 17 | b | | 37 | d |
| 18 | d | | 38 | b |
| 19 | c | | 39 | c |
| 20 | a | | 40 | d |