ANALYTIC SPACE GEOMETRY

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

Consider the point $A(1\,;2\,;3)$**, the straight line** (d) : $(\,x=t-1\;;\;y=t\;;\;z=-t+5\,)$ **where** $t\in IR$ **and the planes** (P) : $2x+y+3z+1=0$ **,** (Q) : $3x-2y+z+12=0$ **and** (R) : $x+2y+3z=0$**.**

1- The orthogonal projection of A on the plane (P) is the point A_1 of coordinates :

a) $(1\,;-2\,;-3)$.
b) $(-3\,;0\,;-3)$.
c) $(3\,;-1\,;-2)$.
d) none of the above answers is correct .

2- The orthogonal projection of A on the axis of abscissas is the point A_2 of coordinates :

a) $(1\,;2\,;0)$.
b) $(1\,;0\,;0)$.
c) $(-1\,;0\,;0)$.
d) $(0\,;2\,;3)$.

3- The distances d_1 , d_2 , d_3 from A to the planes (P), (Q), (R) respectively are such that :

a) $d_1=d_2=2d_3$.
b) $d_1=d_2=14$ and $d_3=\sqrt{14}$.
c) $d_1=d_2=d_3=\sqrt{14}$.
d) $d_1=d_3=\sqrt{14}$ and $d_2=\dfrac{22}{\sqrt{14}}$.

4- A system of parametric equations of the line of intersection of the planes (Q) and (R) is :

a) $x=m$; $y=2m+9$; $z=-m-3$ where $m\in IR$.
b) $x=m$; $y=-m+4.5$; $z=-m+3$ where $m\in IR$.
c) $x=m$; $y=m+4.5$; $z=-m-3$ where $m\in IR$.
d) $x=m$; $y=m+4.5$; $z=m-3$ where $m\in IR$.

5- An equation of the plane parallel to (P) passing through the symmetric of A with respect to O is :

a) $2x+y+3z+13=0$.
b) $2x+y+3z-13=0$.
c) $2x+y+3z+26=0$.
d) $x+2y+3z-13=0$.

COMPLEX NUMBERS

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

Consider the points A , B and L of affixes $z_A = 5-4i$, $z_B = 6+3i$ and $z_L = 2$ and the circle (γ) of center L and radius 5 .

6- A second degree equation whose roots are the affixes of A and B is :

a) $z^2-(11-i)z+42-9i=0$.

b) $z^2+(11-i)z+42-9i=0$.

c) $z^2-(11-i)z+28-9i=0$.

d) $z^2-(11-i)z+42-9i=0$.

7- The circle (γ) is the set of points M of affix z such that :

a) $z\bar{z}+2z+2\bar{z}-25=0$.

b) $z\bar{z}+z+\bar{z}-21=0$.

c) $z\bar{z}-2z-2\bar{z}-21=0$.

d) $z\bar{z}+2z-2\bar{z}-25=0$.

8- The points A and B are such that :

a) A belongs to (γ) and B is exterior to (γ).

b) A is interior to (γ) and B is exterior to (γ) .

c) A and B are interior to (γ).

d) none of the above answers is correct .

9- If C is the point with affix $1-2i\sqrt{6}$, then :

a) the symmetric of C with respect to the axis of ordinates belongs to (γ) .

b) the symmetric of C with respect to the axis of abscissas belongs to (γ) .

c) the symmetric of C with respect to the point L belongs to (γ) .

d) the symmetric of C with respect to the origin O belongs to (γ) .

10- The measure of the angle $(\overrightarrow{LA}\,;\,\overrightarrow{LB})$ in the interval $]-\pi\,;\,\pi]$ is :

a) $-\frac{\pi}{2}$.

b) $-\frac{\pi}{3}$.

c) $\frac{2\pi}{3}$.

d) $\frac{\pi}{2}$.

SEQUENCES

(U_n) , $n \geq 1$, is a geometric sequence such that $U_3 = -5$ and $U_6 = 40$.

11- $U_{10} =$.

a) 320 .
b) 640 .
c) -640 .
d) -320 .

12- The sequence (U_n) is :

a) decreasing .
b) increasing .
c) periodic .
d) not monotonic .

(V_n) is the sequence of first term $V_0 = 2$ such that , for all n in IN , $V_{n+1} = 1 - \frac{1}{V_n}$.

13- The sequence (V_n) is :

a) decreasing .
b) increasing .
c) periodic of period 3 .
d) periodic of period 4 .

14- The sequence (V_n) :

a) has an upper bound and no lower bound .
b) has an lower bound and no upper bound .
c) is bounded by -1 and 2 .
d) is bounded by $\frac{1}{2}$ and 2 .

15- $\lim\limits_{n\to+\infty} V_n$:

a) is a real number .
b) is $+\infty$.
c) is $-\infty$.
d) none of the above answers is correct .

PROBABILITY

A die is weighted so that , when it is rolled , the probability that an even number appears is equal to 0.6 **.**

The die is rolled 6 **times** .

16- The probability that each of the 6 faces appears once is equal to :

a) $(0.4)^3 + (0.6)^3$.
b) $20\times(0.4)^3 \times (0.6)^3$.
c) $6\times(0.4)^3 \times (0.6)^3$.
d) none of the above answers is correct .

The die is rolled 5 **times .**

17- The probability of getting exactly 3 even numbers is equal to :

a) $10 \times (0.4)^3 \times (0.6)^2$.
b) $(0.4)^2 \times (0.6)^3$.
c) $10 \times (0.4)^2 \times (0.6)^3$.
d) none of the above answers is correct .

18- The probability of getting at least one odd number is equal to :

a) $(0.4)^5$.

b) $1-(0.6)^5$.

c) $1-(0.4)^5$.

d) none of the above answers is correct .

The die is rolled 3 **times .**

19- The probability of getting three numbers whose sum is odd is equal to :

a) $(0.4)\times(0.6)^2$.

b) $(0.4)\times(0.6)^2+(0.4)^3$.

c) $3\times(0.4)\times(0.6)^2+3\times(0.4)^3$.

d) $3\times(0.4)\times(0.6)^2+(0.4)^3$.

20- The probability of getting the same number is

a) $(0.4)^3+(0.6)^3$.

b) $(0.4)^3\times(0.6)^3$.

c) $3(0.4)^3+3(0.6)^3$.

d) non of the above answers is correct .

EQUATIONS AND INEQUALITIES

21- The solution set of the equation $\ell n(x-1)+\ell n(x-3)=3\ell n2$ is :

a) $]3\,;+\infty[$.

b) $\{-1\,;5\}$.

c) $\{-5\}$.

d) $\{5\}$.

22- The solution set of the inequality $2\ell n(x-1)-\ell n(5-x)-\ell n2\le 0$ is :

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

b) $[1\,;3]$.

c) $]1\,;\ 5]$.

d) none of the above answers is correct .

23- The solution set of the equation $\exp\left(\ell n(7-x^2)\right)=x^2-7$ is :

a) ϕ .
b) $\left\{\sqrt{7}\right\}$.
c) $\left\{-\sqrt{7}\,;\sqrt{7}\right\}$.
d) none of the previous answers is correct .

24- The solution set of the equation $(\ell n\, x)^2-\ell n\, x=12$ is :

a) $\left\{-3;4\right\}$.
b) $\left\{e^4\right\}$.
c) $\left\{e^{-3}\,;e^{\,4}\right\}$.
d) $\left\{e^{3}\,;e^{-4}\right\}$.

25- The solution set of the inequality $e^{2x}-2e^x-3\le 0$ is :

a) $[-1\,;3]$.
b) $[0\,;3]$.
c) $]-\infty\,;\ell n3]$.
d) $]1\,;\ell n3[$.

INTEGRALS

26- $\displaystyle\int_0^{\ell n2}\frac{e^x}{e^x-4}dx$ is equal to :

a) $\ell n(1.5)$.
b) $\ell n2-\ell n3$.
c) $\ell n2-\ell n4$
d) none of the above answers is correct .

27- $\displaystyle\int_e^{1}\frac{dx}{x(\ell nx\,-2)}$ is equal to :

a) $\ell n2$.
b) 2 .
c) $-\ell n2$.
d) none of the above answers is correct .

28- $\int_{2}^{-2} x e^{-x^4} dx$ is equal to :

a) $2e^{16}$.
b) 0.
c) $-2e^{16}$.
d) none of the above answers is correct .

The function f **is defined on** $]0\,;+\infty[$ **by** $f(x)=\int_{1}^{x}(\ell nt)^6 dt$ **.**

29- The function f is :
a) positive on $]0\,;+\infty[$.
b) negative on $]0\,;+\infty[$.
c) positive on $]0\,;1[$ and negative on $]1\,;+\infty[$.
d) negative on $]0\,;1[$ and positive on $]1\,;+\infty[$.

30- The function f is :
a) decreasing on $]0\,;+\infty[$.
b) increasing on $]0\,;+\infty[$.
c) increasing on $]0\,;1[$ and decreasing on $]1\,;+\infty[$.
d) decreasing on $]0\,;1[$ and increasing on $]1\,;+\infty[$.

DIFFERENTIAL EQUATIONS

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

(E) **is the differential equation** $3y'+2y-6=0$ **.**

31- If f is a solution of (E) then f' is a solution of the differential equation :
a) $3y'-2y=0$.
b) $3y'+2y=0$.
c) $3y''+2y'-6=0$.
d) none of the previous answers is correct .

32- The solution y of (E) such that $y(0)=1$ is such that :

a) $y(x)=3e^{-\frac{2}{3}x}+3$.

b) $y(x)=-2e^{\frac{2}{3}x}-3$.

c) $y(x)=-2e^{-\frac{2}{3}x}+3$.

d) none of the previous answers is correct .

33- The function g is the solution of (E) whose representative curve (γ) passes through O .
An equation of the tangent to (γ) at O is :

a) $y=x+1$.

b) $y=-2x$.

c) $y=2x$.

d) $y=2x+3$.

(F) **is the differential equation** $(x^2+3)y'-xy=0$ **.**

34- The solution y of (F) that satisfies $y(1)=4$ is such that :

a) $y(x)=3\ell n\,x+2x+2$.

b) $y(x)=2\sqrt{x^2+3}$.

c) $y(x)=\sqrt{x^2+3}-3x$.

d) none of the previous answers is correct .

35- Let (C) be the representative curve of the general solution of (F) .
The slope of tangent to (C) at the point of intersection with the axis of ordinates is equal to :

a) 3 .

b) -3 .

c) 0 .

d) 1 .

FUNCTIONS

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

36- The function f defined on IR by $f(x)=\begin{cases} x^2-x-1 & if \quad x\le 1 \\ \sqrt{2x-1}-2 & if \quad x>1 \end{cases}$ is :

a) differentiable and not continuous at 1 .
b) continuous and not differentiable at 1 .
c) continuous and differentiable at 1 .
d) none of the previous answers is correct .

The function h is defined on $IR-\{0\}$ by $h(x)=\dfrac{e^x-2}{e^x-1}$.

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

a) $\ell_1=-\infty$ and $\ell_2=+\infty$.
b) $\ell_1=2$ and $\ell_2=1$.
c) $\ell_1=1$ and $\ell_2=2$.
d) none of the previous answers is correct .

38- $\lim\limits_{x\to0^-} h(x)=L_1$ and $\lim\limits_{x\to0^+} h(x)=L_2$ where :

a) $L_1=+\infty$ and $L_2=-\infty$.
b) $L_1=+\infty$ and $L_2=0$.
c) $L_1=0$ and $L_2=-\infty$.
d) none of the previous answers is correct .

Given the table of variations of a differentiable function u defined on IR .
Let f be the function defined on IR by $f(x)=u(x)\times e^x$.

39- f is differentiable and $f'(x)=$:

x	$-\infty$		0		1		$+\infty$
$u(x)$	0	↘		↘ -1		↗ 0	↗ $+\infty$

a) $u'(x)\times e^x$.
b) $\big(u'(x)-u(x)\big)e^x$.
c) $\big(u'(x)+u(x)\big)e^x$.
d) none of the previous answers is correct .

40- The sense of variation of f in each of the interval $I =]-\infty\,;\,0[$ and $J =]0\,;\,1[$ is such that :

a) f is decreasing in I and increasing in J.

b) f is increasing in I and decreasing in J.

c) f is increasing in each of I and J.

d) f is increasing in I and its sense of variation can not be determined in J.

The function f is defined on $]0\,;+\infty[$ by $f(x) = x\left(\ell n^2\, x + 1\right)$.

Let (C) be the representative curve of f.

41- (C) is tangent to the straight line (d) of equation $y = x$ at a point A of coordinates :

a) $(e^{-1}\,;\,e^{-1})$.

b) $(1\,;1)$.

c) $(e^{-2}\,;\,e^{-2})$.

d) $(e\,;\,2e)$.

42- f has an inverse function f^{-1} defined on the interval :

a) $]0\,;+\infty[$.

b) $]-\infty\,;\,0[$.

c) $[0\,;+\infty[$.

d) $]-\infty\,;+\infty[$.

43- The function g is defined on $]0\,;+\infty[$ by $g(x) = \dfrac{1}{f(x)}$.

Let (γ) be the representative curve of g.

The common point of (γ) and (C) is the point of coordinates :

a) $(e^{-1}\,;\,e^{-1})$.

b) $(1\,;1)$.

c) $(-1\,;-1)$.

d) none of the previous answers is correct .

The function F is defined on IR by $F(x) = e^{x} - e^{-x} - 2x$.

Let (L) be the representative curve of F .

44- The function F is differentiable and $F'(x) =$:

a) $e^{x} - e^{-x} - 2$.

b) $2e^{x} - 2$.

c) $e^{-x}(e^{x}-1)^{2}$.

d) $e^{x}(e^{-2x}-e^{-x}+1)$.

45- The straight line (Δ) of equation $y=-2x-4$ cuts (L) at the point(s) of abscissa(s) :

a) $-2-\sqrt{5}$ and $-2+\sqrt{5}$.

b) $\ell n(-2+\sqrt{5})$ and $\ell n(-2-\sqrt{5})$.

c) $\ell n(\sqrt{5}-2)$ and $-\ell n(\sqrt{5}-2)$.

d) $\ell n(\sqrt{5}-2)$.

TRANSFORMATIONS

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

f is the transformation defined by the complex relation $z'=-2z+4+i$;

g is the transformation defined by the complex relation $z'=(1-i)z+1+2i$.

46- The image by f of the circle of center O and radius 3 is :

a) The circle of center $(-2\ ;0)$ and radius 2 .

b) The circle of center $(1\ ;4)$ and radius 6 .

c) The circle of center $(\frac{4}{3}\ ;\frac{1}{3})$ and radius 6 .

d) The circle of center $(4\ ;1)$ and radius 6 .

47- The area , in units of area , of the image by g of a circle of radius 3 is equal to :

a) 9π .

b) 18π .

c) $9\sqrt{2}\,\pi$.

d) 81π .

48- $f\circ g$ is a similitude whose ratio and angle are respectively equal to :

a) $2\ ;\ -\frac{\pi}{4}\ rad$.

b) $2\sqrt{2}\ ;\ \frac{3\pi}{4}\ rad$.

c) $-2\sqrt{2}\ ;\ -\frac{\pi}{4}\ rad$.

d) $2\sqrt{2}\ ;\ \frac{\pi}{4}\ rad$.

49- $g \circ f$ is a similitude whose ratio and angle are respectively equal to :

a) $2\sqrt{2}$; $-\frac{3\pi}{4}\ rad$.

b) $2\sqrt{2}$; $\frac{\pi}{4}\ rad$.

c) $2\sqrt{2}$; $-\frac{\pi}{4}\ rad$.

d) $2\sqrt{2}$; $\frac{3\pi}{4}\ rad$.

50- $f \circ g(O) = A$ and $g \circ f(O) = B$ where :

a) $A(2\ ;-3)$ and $B(2\ ;-3)$.

b) $A(6\ ;-1)$ and $B(6\ ;-1)$.

c) $A(2\ ;-3)$ and $B(6\ ;-1)$.

d) none of the previous answers is correct .

Grille de correction

Question	Réponse		Question	Réponse
1	d		26	b
2	b		27	a
3	c		28	b
4	c		29	d
5	a		30	b
6	a		31	b
7	c		32	c
8	d		33	c
9	b		34	b
10	d		35	c
11	b		36	c
12	d		37	b
13	c		38	a
14	c		39	c
15	d		40	d
16	b		41	b
17	c		42	a
18	b		43	b
19	d		44	c
20	c		45	d
21	d		46	d
22	d		47	b
23	a		48	b
24	c		49	d
25	c		50	c