2019

12 5 60 .

4 5 20 .

13. (0 2)　　14. $\left[\frac{1}{3}\ \ 3\right]$　　15. 2　　16. $-\frac{1}{4}$

17. (本小题满分 12 分)

( ) $a_3+a_4=6a_5$　　$6q^2-q-1=0$　　$q=\frac{1}{2}$　　$q=-\frac{1}{3}$.

$\{a_n\}$　　1　　$q=\frac{1}{2}$

$a_n=1\times\left(\frac{1}{2}\right)^{n-1}=\left(\frac{1}{2}\right)^{n-1}$. ……………………………6

( ) $T_n=1\cdot\left(\frac{1}{2}\right)^0+2\cdot\left(\frac{1}{2}\right)^1+3\cdot\left(\frac{1}{2}\right)^2+\cdots+n\cdot\left(\frac{1}{2}\right)^{n-1}$

$\frac{1}{2}T_n=1\cdot\left(\frac{1}{2}\right)^1+2\cdot\left(\frac{1}{2}\right)^2+3\cdot\left(\frac{1}{2}\right)^3+\cdots+n\cdot\left(\frac{1}{2}\right)^n$

$\frac{1}{2}T_n=\left(\frac{1}{2}\right)^0+\left(\frac{1}{2}\right)^1+\left(\frac{1}{2}\right)^2+\cdots+\left(\frac{1}{2}\right)^{n-1}-n\cdot\left(\frac{1}{2}\right)^n$

$=\frac{1-\left(\frac{1}{2}\right)^n}{1-\frac{1}{2}}-n\left(\frac{1}{2}\right)^n=2-2\cdot\left(\frac{1}{2}\right)^n-n\cdot\left(\frac{1}{2}\right)^n=2-\frac{n+2}{2^n}$

$T_n=4-\frac{n+2}{2^{n-1}}$. ……………………………12

$$K^2=\frac{200\times\left(100\times26-50\times24\right)^2}{150\times50\times124\times76}=\frac{9800}{1767}\approx5.546>5.024$$

97.5% . ……………………………6

( ) 6 4 2

$P=\frac{6}{15}=\frac{2}{5}$. ……………………………12

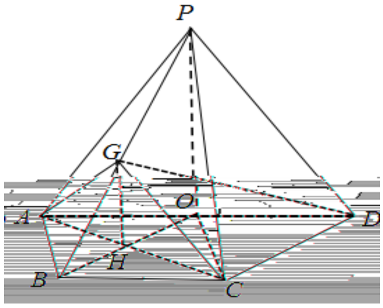
19. (本小题满分 12 分)

( ) AD O OP OB OC. OB AC H GH.

AD BC $AB=BC=CD=\frac{1}{2}AD$

ABCO OBCD

OB AC OB CD $CD\perp AC$



$\because\Delta PAD$ O AD

$\therefore PO\perp AD$

$\because$ $PAD\perp$ $ABCD$ $PAD\cap$ $ABCD=AD$

$PO\subset$ PAD $PO\perp AD$

$\therefore PO\perp$ $ABCD$

$CD\subset$ $ABCD$ $PO\perp CD$

H G OB PB GH PO

$GH\perp CD$

$GH\cap AC=H$ $CD\perp$ GAC . ………………………6

( ) $\frac{V_{D-GAC}}{V_{P-ABC}}=\frac{V_{G-ADC}}{V_{P-ABC}}=\frac{V_{G-ADC}}{2V_{G-ABC}}=\frac{S_{\Delta ADC}}{2S_{\Delta ABC}}=\frac{AD}{2BC}=1:1$. ……………………………12

20. (本小题满分 12 分)

( ) C P (1 $\frac{\sqrt{2}}{2}$) ΔPF_1F_2 $\frac{\sqrt{2}}{2}$ $c=1$ $\frac{1}{a^2}+\frac{1}{2b^2}=1$.

$a^2=b^2+c^2$ $\therefore a^2=b^2+1$ $\frac{1}{b^2+1}+\frac{1}{2b^2}=1$ $2b^4-b^2-1=0$ $b^2=1$ $a^2=2$

C $\frac{x^2}{2}+y^2=1$. ……………………………6

( ) ( ) $F_1\left(-1\ \ 0\right)$ $F_2\left(1\ \ 0\right)$. $A\left(x_1\ \ y_1\right)$ $B\left(x_2\ \ y_2\right)$.

l $\overrightarrow{F_2A}\cdot\overrightarrow{F_2B}=\frac{7}{2}$.

l $l:y=k\left(x+1\right)$ $\left(1+2k^2\right)x^2+4k^2x+2\left(k^2-1\right)=0$.

$\Delta=16k^4-8\left(1+2k^2\right)\left(k^2-1\right)=8k^2+8>0$.

$x_1+x_2=-\frac{4k^2}{1+2k^2}$ $x_1x_2=\frac{2\left(k^2-1\right)}{1+2k^2}$

$$\overrightarrow{F_2A}\cdot\overrightarrow{F_2B}=\left(x_1-1\right)\left(x_2-1\right)+y_1y_2=\frac{7k^2-1}{1+2k^2}=\frac{7}{2}-\frac{\frac{9}{2}}{1+2k^2}$$

$t=1+2k^2\geq 1$ $\overrightarrow{F_2A}\cdot\overrightarrow{F_2B}=\frac{7}{2}-\frac{9}{2\left(2k^2+1\right)}\in\left[-1\ \ \frac{7}{2}\right)$.

$\overrightarrow{F_2A}\cdot\overrightarrow{F_2B}$ $\left[-1,\frac{7}{2}\right]$. ………………………………12

21.（本小题满分 12 分）

( ) $f'(x)=\frac{x^2-(a+1)x+a}{e^x}=\frac{(x-1)(x-a)}{e^x}$ $f'(x)=0$ $x=1$ $x=a$.

$a=1$ $f'(x)\geq 0$ $f(x)$ $(-\infty\ \ +\infty)$.

$a<1$ $f(x)$ $(-\infty\ \ a)$ $(1\ \ +\infty)$ $(a\ \ 1)$.

$a>1$ $f(x)$ $(-\infty\ \ 1)$ $(a\ \ +\infty)$ $(1\ \ a)$.

………………………………6

( ) $\forall x\in[0\ +\infty)$ $f(x)\geq -1$ $x\in[0\ +\infty)$ $f(x)_{\min}\geq -1$.

( ) $a>1$ $x\in[0\ +\infty)$ $f(x)_{\min}=\min\{f(0)\ \ f(a)\}$.

$f(a)=\frac{-a-1}{e^a}$.

$g(a)=\frac{-a-1}{e^a}$ $a>1$ $g'(a)=\frac{a}{e^a}>0$

$g(a)$ $(1\ \ +\infty)$ $g(a)>g(1)=-\frac{2}{e}>-1$ $f(a)>-1$.

$f(0)=-1$ $f(x)_{\min}=-1$.

$a=1$ $f(x)$ $[0\ +\infty)$ $f(x)_{\min}=f(0)=-1$.

$3-e\leq a<1$ ( ) $x\in[0\ +\infty)$ $f(x)_{\min}=\min\{f(0)\ \ f(1)\}$.

$f(1)=\frac{a-3}{e}\geq\frac{(3-e)-3}{e}=-1$.

$f(0)=-1$ $f(x)_{\min}=-1$.

$a\geq 3-e$ $\forall x\in[0\ +\infty)$ $f(x)\geq -1$. ………………………………12

22.（本小题满分 10 分）

( ) C $x^2+y^2=4$ ($y\geq 0$) E $\frac{x^2}{4}+y^2=1$. ………………………………5

( ) A ($2\cos\alpha\ \ 2\sin\alpha$) $\alpha\in[0\ \ \pi]$ ΔAOB B ($2\cos\alpha\ \ -\sin\alpha$).

$S_{\Delta AOB}=\frac{1}{2}|AB|\cdot|x_B|=\frac{1}{2}\cdot 3\sin\alpha\cdot 2\cos\alpha=\frac{3}{2}\sin 2\alpha$

$2\alpha\in[0\ 2\pi]$

$\alpha=\frac{\pi}{4}$ ΔAOB $\frac{3}{2}$. ………………………………10

23. (本小题满分 10 分)

( ) $f(x)=3|x-1|+|x+1|=\begin{cases}-4x+2 & x\le -1\\ -2x+4 & -1<x<1\\ 4x-2 & x\ge 1\end{cases}$

$x=1$ $f(x)$ $k=2$. ……………………………5

( ) $m^2+4n^2=2$.

$$\frac{1}{m^2}+\frac{1}{n^2+1}=\frac{1}{m^2}+\frac{4}{4n^2+4}=\left(\frac{1}{m^2}+\frac{4}{4n^2+4}\right)\left(m^2+4n^2+4\right)\cdot\frac{1}{6}$$

$$=\frac{1}{6}\left[1+\frac{4n^2+4}{m^2}+\frac{4m^2}{4n^2+4}+4\right]\ge\frac{1}{6}\left(5+2\sqrt{4}\right)=\frac{3}{2}\ .$$

$\frac{4n^2+4}{m^2}=\frac{4m^2}{4n^2+4}$ $m^2=2$ $n=0$.

……………………………10