e , ln

( ) > 0

( ) < 0

10

$(\ \ -2)e$ <0 $(\ \ -2)e$

$(-\infty,0)$ $(\ \ -2)e\ \ >-2$ $(\ \ 1)^2$ $-2+\ (\ \ -1)^2=0$

$=1\pm\sqrt{2}$ $_0<0$ $_0<1-\sqrt{2}$ $(_0-1)^2>0$ $_0$

<0 $e\ \ <1$ $(\ \ -$ $-2\ \ 2$

$(\ \ -1)^2>\ \ ^2$ $(\ \ )>\ \ -2+\ (\ \ -1)^2>2$ $+\ \ ^2$ 2

$_0<-2$ $_0<-\frac{2}{\ }$ $(_0)>2\ _0+\ _0^2>0$ $_0$

$e\ \ \ge 1+$

$(\ \ )=\ \ e^2\ +(\ \ -2)e\ \ -$

$(\ \ )$

$'(\ \ )=(\ \ \ -1)(2\ \ +1)$ ≤ 0 $(\ \ )$

>0 $(\ \ )$ $(-\infty,-\ln\ \ )$ $(-\ln\ \ ,+\infty)$ $=-\ln$

$(-\ln\ \ )=1-\frac{1}{\ }+\ln$ $0<\ \ <1$ $(-\ln\ \ )<0$

$-\!>\ =$

$\lim\limits_{\to-\infty}(\ \ )=+\infty$ $\lim\limits_{\to+\infty}(\ \ )=+\infty$ $(\ \ )$

$(-\infty,-\ln\ \ )$ $(\ \ )=\ \ e^2\ +(\ \ -2)e\ \ -\ \ >-2e\ \ -$ <0

$-2e\ \ -\ \ >-2-$ $-2-\ \ =0$ $=-2$ $(-2)>-2-(-2)=0$ $-2<0<-\ln$

$(\ ) = e^2 + (\ -2)e - \ > e^2 + (\ -2)e - e = e\left(e + 1 - \frac{3}{}\right)$

${}_0 = \ln\left(\frac{3}{} - 1\right)$ $(\ {}_0) > 0$ $\ln\left(\frac{3}{} - 1\right) > 1$ $\ln\left(\frac{3}{} - 1\right)$

$(\ ) = e - \ {}^2$ $(\ )$ $(0, +\infty)$

$'(\ ) = e - 2$ $'(\ ) = 0$ $(\ )$

$(\ ) = 1 - \frac{{}^2}{e}$ $(\ )$ $(0, +\infty)$ $(\ )$ $(0, +\infty)$

≤ 0 $'(\ ) = \frac{(\ -2)}{e}$ > 0 $(\ )$

$(0, 2)$ $(2, +\infty)$ $= 2$ $(2) = 1 - \frac{4}{e^2}$ $> \frac{e^2}{4}$

$(2) < 0$ $(0) = 1$ $\lim\limits_{\to +\infty} (\ ) = 1$

$(2, +\infty)$ $(2, +\infty)$ $e \ \ge \ + 1 >$ $e^{\frac{}{3}} \ge \frac{}{3}$

$e \ \ge \frac{{}^3}{27}$ $(\ ) = 1 - \frac{{}^2}{e} > 1 - \frac{{}^2}{\frac{{}^3}{27}} = 1 - \frac{27}{}$ $1 - \frac{27}{} = 0$ $= 27$

$(27\ ) > 0$ $27\ > 1$ 27 $> \frac{e^2}{4}$ $(\ )$

$< \frac{e^2}{4}$ $(\ )$ $= \frac{e^2}{4}$ $(\ )$

$= \frac{e^2}{4}$

e α $\to +\infty$ e $\frac{{}^3}{27}$ ^{2}

$(\ ) \quad \to +\infty$ $\quad 1-\dfrac{27}{\ } = 0$

$\ln$

$(\ ) = \ln \ + \ +1$ $\quad {}_1, \ {}_2$

$'(\ ) = \dfrac{1}{\ } +$ $\quad < 0$ $\quad (\ )$ $\left(0, -\dfrac{1}{\ }\right)$ $\quad \left(-\dfrac{1}{\ }, +\infty\right)$

$= -\dfrac{1}{\ }$ $\quad \left(-\dfrac{1}{\ }\right) = \ln\left(-\dfrac{1}{\ }\right)$ $\quad -1 < \ < 0$

$\left(-\dfrac{1}{\ }\right) > 0$ $\quad \lim\limits_{\to 0^+} (\ ) = -\infty$ $\quad \lim\limits_{\to +\infty} (\ ) = -\infty$

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$\left(0, -\dfrac{1}{\ }\right)$ $\quad \dfrac{1}{e}$ $\quad \left(\dfrac{1}{e}\right) = \ln\left(\dfrac{1}{e}\right) + \dfrac{\ }{e} + 1 = \dfrac{\ }{e} < 0$ $\quad \dfrac{1}{e}$

$\left(-\dfrac{1}{\ }, +\infty\right)$ $\quad \ln \ \le \ -1$ $\quad \ln\sqrt{\ } \le \sqrt{\ } - 1$ $\quad \ln \ \le 2\left(\sqrt{\ } - 1\right) < 2\sqrt{\ } - 1$

$(\ ) = \ln \ + \ +1 < 2\sqrt{\ } +$ $\quad 2\sqrt{\ } + \ = 0$ $\quad = \dfrac{4}{\ {}^2}$ $\quad \left(\dfrac{4}{\ {}^2}\right) < 0$

$\dfrac{4}{\ {}^2} > -\dfrac{1}{\ }$ $\quad \dfrac{4}{\ {}^2}$

$\ln \ \le \ -1$

-1 $\quad \to +\infty$

$\ln \ \le 2\left(\sqrt{\ } - 1\right) < 2\sqrt{\ } - 1$ $\quad 2\sqrt{\ } - 1$ $\quad \to +\infty$

$(\ ) = \ln\dfrac{e}{2} -$ $\quad (\ ) = \dfrac{-4}{\ }$ $\quad > 0$ $\quad (\ ) = \ (\ ) - \ (\ )$

$(\ ) = \ (\ ) - \ (\ ) = \ln\dfrac{\ }{2} - \left(\ -\dfrac{4}{\ }\right)$ $\quad '(\ ) = \dfrac{1}{\ } - \ -\dfrac{4}{\ {}^2}$ $\quad 0 < \ < \dfrac{1}{4}$ $\quad (\ )$

$(0, \ {}_1)$ $\quad (\ {}_1, \ {}_2)$ $\quad (\ {}_2, +\infty)$ $\quad (2) = 0$

${}_1 < 2 < \ {}_2$ $\quad (\ {}_1) < 0$ $\quad (\ {}_2) > 0$ $\quad \lim\limits_{\to 0^+} (\ ) = +\infty$ $\quad \lim\limits_{\to +\infty} (\ ) = -\infty$ $\quad (\ )$

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$(0,\ {}_{1})$ $<\frac{1}{}$ <1 $(\ )=\ln\frac{}{2}-\ +\frac{4}{}>\ln\ +\frac{4}{}-2$

$\ln\ \leq\ -1$ $\ln\frac{1}{}\leq\frac{1}{}-1$ $\ln\ \geq 1-\frac{1}{}$ $\sqrt{\ }$ $\ln\sqrt{\ }\geq 1-\frac{1}{\sqrt{\ }}$ $\ln\ \geq 2-\frac{2}{\sqrt{\ }}$

$(\ )>\ln\ +\frac{4}{}-2>2\cdot\frac{2\ -\sqrt{\ }}{}$ $2\ -\sqrt{\ }=0$ $=4\ ^{2}$ $4\ ^{2}<\frac{1}{}$

$(4\ ^{2})>0$ $4\ ^{2}<\frac{1}{}$ $4\ ^{2}$.

$(\ {}_{2},+\infty)$ >4 $\frac{4}{}<1$ $(\ )=\ln\frac{}{2}-\ +\frac{4}{}<\ln\ -\ +2$

$\ln\ \leq\ -1$ $\ln\ <2\sqrt{\ }-2$ $(\ )<2\sqrt{\ }-2-\ +2=2\sqrt{\ }-$ $2\sqrt{\ }-\ =0$

$=\frac{4}{{}_{2}}$ $\left(\frac{4}{{}_{2}}\right)<0$ $\frac{4}{{}_{2}}>4$ $\frac{4}{{}_{2}}$.

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