

e ,ln

( )>0

( )<0

$$\begin{aligned}
 & (-\infty, 0) \quad (-2)e > -2 \quad ( ) > -2 + (-1)^2 \\
 & = 1 \pm \sqrt{\frac{2}{-}} \quad 0 < 0 \quad 0 < 1 - \sqrt{\frac{2}{-}} \quad (0) > -2 + (0 - \dots) = 0 \quad 0 \\
 & < 0 \quad e < 1 \quad (-2)e > -2 \quad < -2 \quad -2 \quad 2 \\
 & (-1)^2 > \dots \quad ( ) > -2 + (-1)^2 > 2 + \dots \quad 2 + \dots = 0 \quad = -\frac{2}{\dots} \\
 & 0 < -2 \quad 0 < -\frac{2}{\dots} \quad (0) > 2 \quad 0 + \dots > 0 \quad 0
 \end{aligned}$$

$$e \geq 1 +$$

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

( )

$$\begin{aligned}
 & '( ) = ( -1)(2 + 1) \quad 0 \quad ( ) \\
 & > 0 \quad ( ) \quad (-\infty, -\ln ) \quad (-\ln , +\infty) \quad = -\ln \\
 & (-\ln ) = 1 - \frac{1}{\dots} + \ln \quad 0 < < 1 \quad (-\ln ) < 0
 \end{aligned}$$

$$\lim_{\rightarrow -\infty} ( ) = +\infty \quad \lim_{\rightarrow +\infty} ( ) = +\infty \quad ( )$$

$$\begin{aligned}
 & (-\ln, -\ln ) \quad ( ) = e^2 + (-2)e - > -2e - < 0 \\
 & -2e - > -2 - \quad -2 - = 0 \quad = -2 \quad (-2) > -2 - (-2) = 0 \quad -2 < 0 < -\ln
 \end{aligned}$$

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

$$f(0) = \ln\left(\frac{3}{e}-1\right) \quad f'(0) > 0 \quad \ln\left(\frac{3}{e}-1\right) > 1 \quad \ln\left(\frac{3}{e}-1\right)$$

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

$$f'(x) = e^{-2x} \quad f'(x) = 0 \quad f(x)$$

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

$$\leq 0 \quad f'(x) = \frac{(x-2)}{e} > 0 \quad f(x)$$

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

$$(2) < 0 \quad f(0) = 1 \quad \lim_{x \rightarrow +\infty} f(x) = 1$$

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

$$e \geq \frac{3}{27} \quad f(x) = 1 - \frac{x^2}{e} > 1 - \frac{27}{3} = 1 - \frac{27}{27} \quad 1 - \frac{27}{27} = 0 \quad = 27$$

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

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

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

$$e \quad x \rightarrow +\infty \quad e \quad \frac{3}{27} \quad 2$$

$$f(x) \rightarrow +\infty \quad 1 - \frac{27}{e} = 0$$

ln

$$f(x) = \ln x + \frac{1}{x} + 1 \quad x \in (0, 2)$$

$$f'(x) = \frac{1}{x} - \frac{1}{x^2} < 0 \quad f(x) \text{ on } \left(0, -\frac{1}{e}\right) \quad \left(-\frac{1}{e}, +\infty\right)$$

$$f\left(-\frac{1}{e}\right) = -\frac{1}{e} \quad f\left(-\frac{1}{e}\right) = \ln\left(-\frac{1}{e}\right) - 1 < 0$$

$$\lim_{x \rightarrow 0^+} f(x) = -\infty \quad \lim_{x \rightarrow +\infty} f(x) = -\infty$$

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

$$f\left(-\frac{1}{e}, +\infty\right) \quad \ln x \leq -1 \quad \ln \sqrt{x} \leq \sqrt{x} - 1 \quad \ln x \leq 2(\sqrt{x} - 1) < 2\sqrt{x} - 1$$

$$f(x) = \ln x + \frac{1}{x} + 1 < 2\sqrt{x} + \frac{1}{x} \quad 2\sqrt{x} + \frac{1}{x} = 0 \quad = \frac{4}{x} \quad \left(\frac{4}{x}\right) < 0$$

$$\frac{4}{x} > -\frac{1}{x} \quad \frac{4}{x}$$

$$-1 \quad \rightarrow +\infty \quad \ln x \leq -1$$

$$\ln x \leq 2(\sqrt{x} - 1) < 2\sqrt{x} - 1 \quad 2\sqrt{x} - 1 \rightarrow +\infty$$

$$f(x) = \ln \frac{e}{2} - \frac{1}{2} \quad f(x) = \frac{-4}{x} > 0 \quad f(x) = f(x) - f(x)$$

$$f(x) = f(x) - f(x) = \ln \frac{e}{2} - \left(-\frac{4}{x}\right) \quad f'(x) = \frac{1}{x} - \frac{4}{x^2} \quad 0 < f'(x) < \frac{1}{4} \quad (x)$$

$$(0, x_1) \quad (x_1, x_2) \quad (x_2, +\infty) \quad f(x_2) = 0$$

$$x_1 < 2 < x_2 \quad f(x_1) < 0 \quad f(x_2) > 0 \quad \lim_{x \rightarrow 0^+} f(x) = +\infty \quad \lim_{x \rightarrow +\infty} f(x) = -\infty \quad (x)$$

$$\begin{aligned}
& (0, 1) \quad < \frac{1}{2} < 1 \quad ( ) = \ln \frac{1}{2} - \frac{4}{2} > \ln \frac{1}{2} + \frac{4}{2} - 2 \\
\ln \leq -1 \quad \ln \frac{1}{2} \leq \frac{1}{2} - 1 \quad \ln \geq 1 - \frac{1}{2} \quad \sqrt{\quad} \quad \ln \sqrt{\quad} \geq 1 - \frac{1}{\sqrt{\quad}} \quad \ln \geq 2 - \frac{2}{\sqrt{\quad}} \\
( ) > \ln \frac{1}{2} + \frac{4}{2} - 2 > 2 \cdot \frac{2 - \sqrt{\quad}}{2 - \sqrt{\quad}} \quad 2 - \sqrt{\quad} = 0 \quad = 4^{-2} \quad 4^{-2} < \frac{1}{2} \\
(4^{-2}) > 0 \quad 4^{-2} < \frac{1}{2} \quad 4^{-2} \quad . \\
( )_{(2, +\infty)} > 4 \quad \frac{4}{2} < 1 \quad ( ) = \ln \frac{1}{2} - \frac{4}{2} < \ln \frac{1}{2} - \frac{4}{2} + 2 \\
\ln \leq -1 \quad \ln < 2\sqrt{\quad} - 2 \quad ( ) < 2\sqrt{\quad} - 2 - \frac{4}{2} + 2 = 2\sqrt{\quad} - 2\sqrt{\quad} - \frac{4}{2} = 0 \\
= \frac{4}{2} \quad \left( \frac{4}{2} \right) < 0 \quad \frac{4}{2} > 4 \quad \frac{4}{2} \quad .
\end{aligned}$$