

$$\lim_{x \rightarrow 1} \frac{x^2 - \sqrt{x+2}}{x^2 - 1} = \frac{0}{0} \Rightarrow \frac{x^2 - \sqrt{x+2}}{(x-1)(x+1)} = \frac{x + \frac{1}{x}}{x + \frac{x}{0}} = \boxed{\frac{1}{2}}$$

(۲) - ۱

$$\lim_{x \rightarrow 0} \frac{|\sqrt{x-1}| - |\sqrt{x+1}|}{x} = \frac{1 - \sqrt{x} - \sqrt{x+1}}{x} = \frac{-\sqrt{x}}{x} = \boxed{-\frac{1}{2}}$$

(۲) - ۲

$$\lim_{x \rightarrow 4} \frac{x-4}{\sqrt{x}-2} = \frac{0}{0} \Rightarrow \frac{(\sqrt{x}-2)(\sqrt{x}+2)}{\sqrt{x}-2} = \sqrt{x+2} = \boxed{4}$$

(۲) - ۳

$$\lim_{x \rightarrow 4} \frac{x - \sqrt{x}}{x^2 - 3 - 4} = \frac{0}{0} \Rightarrow \frac{\sqrt{x}(\sqrt{x}-\sqrt{x})}{(\sqrt{x}-\sqrt{x})(\sqrt{x}+2)} = \frac{\sqrt{x}}{(\sqrt{x})(\sqrt{x})} = \boxed{\frac{1}{4}}$$

(۲) = ۴

$$\lim_{x \rightarrow 1} \frac{1-\sqrt{x}}{x-\sqrt{x+2}} = \frac{0}{0} \Rightarrow \frac{1-\sqrt{x}}{x-\sqrt{x+2}} \times \frac{1+\sqrt{x}}{1+\sqrt{x}} \times \frac{x+\sqrt{x+2}}{x+\sqrt{x+2}} = \frac{1-x}{x-\sqrt{x+2}} \times \frac{x}{x+\sqrt{x+2}} = \frac{1-x}{-1+x} \times \frac{x}{x} = \boxed{-1}$$

(۲) - ۵

$$\lim_{x \rightarrow 4} \frac{\sqrt{x+4} - 4}{\sqrt{x+1} - 2} = \frac{0}{0} \Rightarrow \frac{\sqrt{x+4} - 4}{\sqrt{x+1} - 2} \times \frac{\sqrt{x+4} + 4}{\sqrt{x+4} + 4} \times \frac{\sqrt{x+1} + 2}{\sqrt{x+1} + 2} = \frac{x+4-16}{x+1-4} \times \frac{\sqrt{x+1} + 2}{\sqrt{x+4} + 4} = \frac{x+4-16}{x+1-4} \times \frac{\sqrt{x+1} + 2}{\sqrt{x+4} + 4} = \boxed{\frac{11}{8}}$$

(۲) - ۶

$$\lim_{x \rightarrow 1} \frac{\sqrt{x+2} - 2}{\sqrt{x} - 1} = \frac{0}{0} \Rightarrow \frac{\sqrt{x+2} - 2}{\sqrt{x} - 1} \cdot \frac{\sqrt{x+2} + 2}{\sqrt{x+2} + 2} = \frac{x+2-4}{x-1} = \frac{x-2}{x-1} = \frac{x-1-1}{x-1} = \frac{x-1}{x-1} - \frac{1}{x-1} = 1 - \frac{1}{x-1}$$

$$\lim_{x \rightarrow 1} \frac{x-1}{1} \cdot \frac{1}{x-1} = \frac{1}{1} = 1$$

$$\lim_{x \rightarrow \pi} \frac{1 + \cos x}{\sin^2 x} = \frac{0}{0} \Rightarrow \frac{(1 + \cos x)(1 + \cos x)}{(1 - \cos x)(1 + \cos x)} = \frac{1 + \cos x}{1 - \cos x}$$

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \tan x}{\sin x - \cos x} = \frac{0}{0} \Rightarrow \frac{-(1 + \tan^2 x)}{\cos x + \sin x} = \frac{-2}{\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}} = \frac{-2}{\sqrt{2}} = -\sqrt{2}$$

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan^2 x - 1}{\cos^2 x} = \frac{0}{0} \Rightarrow \frac{\tan^2 x - 1}{1 + \tan^2 x} = -(1 + \tan^2 x) = -2$$