

$$\text{الف)} \lim_{x \rightarrow 2^+} \frac{2x+5}{x+1} = \frac{2(2)+5}{2+1} = 3$$

$$\text{ب)} \lim_{x \rightarrow 2^-} \frac{2x+5}{x+1} = \frac{2(2)+5}{2+1} = 3$$

$$\text{ج)} \lim_{x \rightarrow 2} \frac{2x+5}{x+1} = 3$$

انجمن

$$\text{د)} x \in (-1, 1) \left\{ \begin{array}{l} 2x+1 > 0 > 0 \\ 1 > x^2 > 0 \rightarrow [x^2] = 0 \end{array} \right\} \lim_{x \rightarrow 0} \frac{2x+1}{[x^2]} = \text{قرین نشده است}$$

$$\text{الف)} \lim_{x \rightarrow 2^-} f[x] - 2 = \lim_{x \rightarrow 2^-} f(2) - 2 = 9$$

$2 < x < 3 \rightarrow [x] = 2$

$$\text{ب)} \lim_{x \rightarrow 2^-} [fx - 2] = \lim_{x \rightarrow 2^-} 11 - 2 = 9$$

$\frac{11}{f} < x < 3 \rightarrow [fx] = 11$

$$\text{ج)} \left[\lim_{x \rightarrow 2^-} fx - 2 \right] = [11] = 10$$

$$\text{د)} \left[\lim_{x \rightarrow 2^+} fx - 2 \right] = [10] = 10$$

$$\text{الف)} \lim_{x \rightarrow 2^-} \frac{3[x]+1}{2} = \frac{3(2)+1}{2} = \frac{7}{2}$$

$2 < x < 3 \rightarrow [x] = 2$

$$\text{ب)} \lim_{x \rightarrow 2^-} \left[\frac{3x+1}{2} \right] \rightarrow \lim_{x \rightarrow 2^-} \left[\frac{7x+1}{2} \right] = 7$$

$x \rightarrow 2^- \rightarrow \frac{7}{2} < x < 3 \rightarrow 4 < \frac{7x+1}{2} < 5 \rightarrow \left[\frac{7x+1}{2} \right] = 4$

$$\text{ج)} \left[\lim_{x \rightarrow 2^-} \frac{3x+1}{2} \right] = [4] = 4 \quad \text{د)} \left[\lim_{x \rightarrow 2^+} \frac{3x+1}{2} \right] = [5] = 5$$

$$\text{الف)} \lim_{x \rightarrow 1} \frac{x-5}{x^2-2x+5} = \lim_{x \rightarrow 1} \frac{x-5}{(x-1)(x-5)} = \lim_{x \rightarrow 1} \frac{1}{x-1} \begin{cases} x \rightarrow 1^+ : +\infty \\ x \rightarrow 1^- : -\infty \end{cases}$$

$$\text{ب)} \lim_{x \rightarrow 2} \frac{x-2}{(x-2)^2} \rightarrow \left. \begin{array}{l} \text{H.H.} \\ x \rightarrow 2: g(x) = (x-2)^2 > 0 \\ \lim_{x \rightarrow 2} g(x) = 0 \end{array} \right\} \Rightarrow \lim_{x \rightarrow 2} \frac{x-2}{(x-2)^2} = -\infty$$

$\lim_{x \rightarrow 2} f(x) = -1 < 0$

$$\text{الف) } \lim_{x \rightarrow -3} [-3x] - [2x] = \lim_{x = -3-\epsilon} [-3\epsilon] - [2\epsilon] \quad \text{با } \epsilon > 0$$

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$$\frac{1}{10} > \epsilon > 0 \rightarrow \begin{cases} [-3\epsilon] = -1 \\ [2\epsilon] = 0 \end{cases} \lim_{\epsilon \rightarrow 0^+} [-3\epsilon] - [2\epsilon] - y = \underline{\underline{-1}}$$

حد ندارد

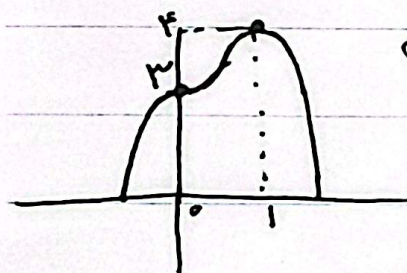
$$\frac{1}{10} < \epsilon < 0 \rightarrow \begin{cases} [-3\epsilon] = 0 \\ [2\epsilon] = -1 \end{cases} \lim_{\epsilon \rightarrow 0^-} [-3\epsilon] - [2\epsilon] - y = \underline{\underline{-1}}$$

$$\text{ب) } x < -\frac{1}{2} \rightarrow x^2 > \frac{1}{4} \rightarrow \frac{-1}{x^2} > -4 \rightarrow \left[\frac{-1}{x^2} \right] = -4$$

$$\lim_{x \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{x^2} \right] = \underline{\underline{-4}} \quad \text{حد دارد}$$

$$f(x) = 4x^3 - 3x^4 + 3 \rightarrow f'(x) = 12x^2 - 12x^3 \rightarrow f'(x) = 0 \rightarrow x = 0, 1$$

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$$\text{الف) } \lim_{x \rightarrow 1} [f(x)] = 3$$

$$\text{ب) } \lim_{x \rightarrow 0^+} [f(x)] = 3$$

$$\lim_{x \rightarrow 0^-} [f(x)] = 2$$

$$\text{الف) } \lim_{x \rightarrow 2} \frac{|x^3 - 8|}{x^3 - 4} = \lim_{x \rightarrow 2} \frac{|x-2|}{x-2} \times \underbrace{\frac{|x^2 + 2x + 4|}{x+2}}_3 = 3 \lim_{x \rightarrow 2} \frac{|x-2|}{x-2}$$

$$x \rightarrow 2^+ : +3 \quad \text{حد دارد}$$

$$x \rightarrow 2^- : -3$$

$$\text{ب) } \lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin^2 x} = \lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin x} \times \frac{1}{\underbrace{\sin x}_{-\frac{1}{2}}} = -\frac{1}{2} \lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin x}$$

$$x \rightarrow \pi^+ : +\frac{1}{2}$$

$$x \rightarrow \pi^- : -\frac{1}{2}$$

حد ندارد

$$\text{الف) } \lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x} \Rightarrow x \rightarrow \frac{\pi}{2}^- : \cos x < 0 \quad \text{تعریف نشده است} \quad \text{با } \cos x > 0$$

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$$\text{ب) } \lim_{x \rightarrow 0} \sqrt{x-2\sqrt{x}} \Rightarrow x \rightarrow 0^- : x < 0 \rightarrow \text{تعریف نشده است}$$

$\text{a)} \lim_{x \rightarrow 0^+} \frac{(-1)^{[\sin x]}}{x^x - x^x}$
 $\left. \begin{array}{l} x \rightarrow 0^+ : 0 < x < 1 \rightarrow [\sin x] = 0 \\ \rightarrow x^x(x-1) < 0 \end{array} \right\} \quad (9)$

$\rightarrow \lim_{x \rightarrow 0^+} \frac{(-1)^0}{x^x(x-1)} = \lim_{x \rightarrow 0^+} \frac{1}{x^x(x-1)} = -\infty$: در آنجا دارد

$\text{b)} \lim_{x \rightarrow 2^+} \frac{x^x - [x^x]}{x - [x]}$
 $\rightarrow \lim_{x \rightarrow 2^+} \frac{x^x - [x^x]}{x - [x]} = \lim_{x \rightarrow 2^+} \frac{x^x - 2}{x - 2} = \lim_{x \rightarrow 2^+} (x+2) = 4$
 در آنجا دارد

$\rightarrow \lim_{x \rightarrow 2^-} \frac{x^x - [x^x]}{x - [x]} = \lim_{x \rightarrow 2^-} \frac{x^x - 1}{x - 1} = 1$

