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الف) $\lim_{x \rightarrow 2^+} \frac{2x+5}{x+1} = \frac{9}{3} = 3$ / ب) $\lim_{x \rightarrow 2^-} \frac{2x+5}{x+1} = \frac{9}{3} = 3$ / ج) $\lim_{x \rightarrow 2} \frac{2x+5}{x+1} = \frac{9}{3} = 3$ ✓

د) $\lim_{x \rightarrow 0} \frac{2x+3}{x^2} = \frac{3}{0^+} = +\infty$ / $\lim_{x \rightarrow 0} \frac{2x+3}{x^2} = \lim_{x \rightarrow 0} \frac{2(0)+3}{[0]} = \frac{3}{0}$ تعریف نشده ✓
خارج صفر دقت می شود ←

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الف) $\lim_{x \rightarrow 3^-} f(x) - 2 = f(3^-) - 2 = 4$ / ب) $\lim_{x \rightarrow 3^-} [f(x) - 2] = [4^-] = 4$ ✓

ج) $\left[\lim_{x \rightarrow 3^-} f(x) - 2 \right] = 10$ / د) $\left[\lim_{x \rightarrow 3^+} f(x) - 2 \right] = [10] = 10$ ✓

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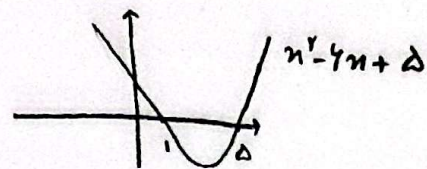
الف) $\lim_{x \rightarrow 3^-} \frac{3(x)+1}{2} = \frac{3(3^-)+1}{2} = \frac{10}{2} = 5$ ✓

ب) $\lim_{x \rightarrow 3^-} \left[\frac{3x+1}{2} \right] = [5^-] = 5$ ✓

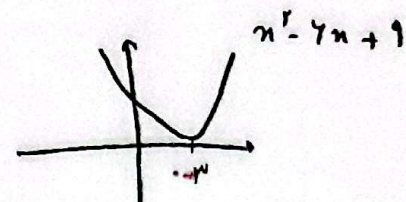
ج) $\left[\lim_{x \rightarrow 3^-} \frac{3x+1}{2} \right] = [5] = 5$ ✓

د) $\left[\lim_{x \rightarrow 3^+} \frac{3x+1}{2} \right] = [5] = 5$ ✓

$$\text{الف) } \lim_{x \rightarrow 1} \frac{x - \Delta}{x^2 - 4x + \Delta} \begin{cases} \xrightarrow{1^+} \frac{-f}{0^-} = +\infty \\ \xrightarrow{1^-} \frac{-f}{0^+} = -\infty \end{cases}$$



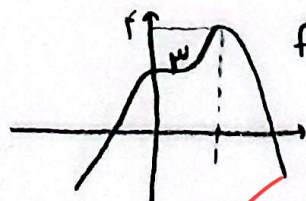
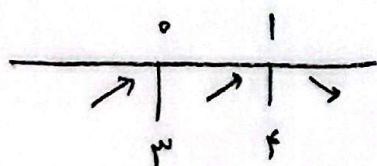
$$\text{ب) } \lim_{x \rightarrow 3} \frac{x - f}{x^2 - 4x + 9} = \begin{cases} \xrightarrow{3^+} \frac{-1}{0^+} = -\infty \\ \xrightarrow{3^-} \frac{-1}{0^-} = -\infty \end{cases} \rightarrow \lim_{x \rightarrow 3} f(x) = -\infty$$



$$\text{الف) } \lim_{x \rightarrow -3} [-3x] - [\Delta x] \begin{cases} \xrightarrow{(-3)^+} [9^-] - [(-1\Delta)^+] = 9 - (-1\Delta) = 23 \\ \xrightarrow{(-3)^-} [9^+] - [(-1\Delta)^-] = 9 - (-1\Delta) = 2\Delta \end{cases}$$

$$\text{ب) } \lim_{x \rightarrow (-1/7)^-} \left[\frac{-1}{x^2} \right] = \left[\frac{-1}{(x^2)^-} \right] = \left[\frac{-1}{(1/7^+)^2} \right] = \left[\frac{-1}{1/49^+} \right] = [(-14)^+] = -14$$

$$\text{الف) } \lim_{x \rightarrow 1} [f(x)^3 - 3x^2 + 3] \xrightarrow[\text{مشتق}]{\text{رسم بياني}} f'(x) = -12x^2 + 12x \rightarrow 12x^2(-x + 1)$$



$$f(x) = f(x)^3 - 3x^2 + 3$$

$$\xrightarrow[\text{رسم بياني}]{\text{باتوجه}} \lim_{x \rightarrow 1} [f(x)] = [f^-] = 3$$

$$\text{ب) } \lim_{x \rightarrow 0} [f(x)] = \begin{cases} \xrightarrow{0^+} [3^+] = 3 \\ \xrightarrow{0^-} [3^-] = 2 \end{cases}$$

-V

$$\text{الف) } \lim_{x \rightarrow 2} \frac{|x^3 - 8|}{x^2 - 4} = \begin{cases} \lim_{x \rightarrow 2^+} \frac{x^3 - 8}{x^2 - 4} \stackrel{H}{=} \frac{3 \cdot 2^2}{2 \cdot 2} = \frac{3}{1} \cdot 2 = 3 \\ \lim_{x \rightarrow 2^-} \frac{-x^3 + 8}{x^2 - 4} \stackrel{H}{=} \frac{-3 \cdot 2^2}{2 \cdot 2} = -\frac{3}{1} \cdot 2 = -3 \end{cases}$$

ب) $\lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin 2x}$

$$\begin{cases} \lim_{x \rightarrow \pi^+} \frac{-\sin x}{2 \sin x \cos x} = \frac{-1}{2 \cos \pi} = \frac{1}{2} \\ \lim_{x \rightarrow \pi^-} \frac{\sin x}{2 \sin x \cos x} = \frac{-1}{2} \end{cases}$$

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الف) $\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x}$

زیر ادیکال منفی غلط

$$\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x} \rightarrow \begin{cases} \lim_{x \rightarrow \frac{\pi}{2}^+} \sqrt{\cos x} = \lim_{x \rightarrow \frac{\pi}{2}^+} \sqrt{0^+} = 0 \\ \lim_{x \rightarrow \frac{\pi}{2}^-} \sqrt{\cos x} = \lim_{x \rightarrow \frac{\pi}{2}^-} \sqrt{0^-} = \text{تعریف نشده} \end{cases}$$

ب) $\lim_{x \rightarrow 0} \sqrt{x - 2\sqrt{x}}$

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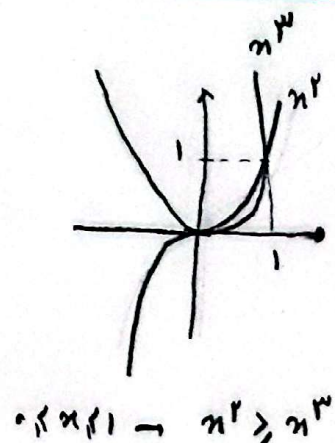
$D_f = x \geq 0, x \geq 4$

$\rightarrow (\sqrt{x})^2 \geq 4 \rightarrow \sqrt{x} \geq 2$

$\rightarrow x \geq 4$

الف) $\lim_{x \rightarrow 0^+} \frac{(-1)^{[\sin x]}}{x^3 - x^2} = \frac{(-1)^{[0^+]}}{x^3 - x^2} = \frac{1}{x^3 - x^2}$

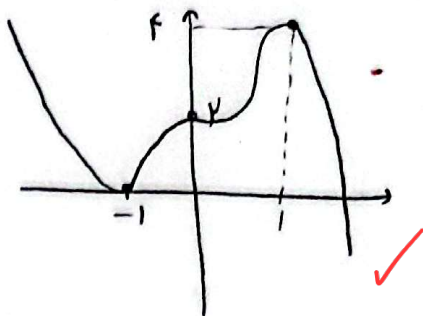
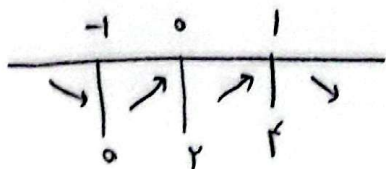
$\rightarrow \frac{1}{0^-} = -\infty$



$$\text{ب) } \lim_{x \rightarrow r} \frac{x^r - [x^r]}{x - [x]} \begin{cases} r+ & \frac{x^r - f}{x - r} \stackrel{①}{=} \frac{r^r}{1} = f \\ r- & \frac{x^r - r^r}{x - r} = \frac{1}{1} = 1 \end{cases}$$

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$$\text{أ) } y = 2x^3 - 3x^2 + x \rightarrow f'(x) = -10x^4 + 10x^2 \rightarrow 10x^2(-x^2 + 1)$$



$$\text{ب) } y = x^4 - 2x^3 + 3 \rightarrow f'(x) = 4x^3 - 6x^2 \rightarrow 2x^2(2x - 3)$$

②

