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

$$\text{د) } \lim_{x \rightarrow 0} \frac{2x+5}{(x^2)} = \frac{5}{0^+} = +\infty$$

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

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

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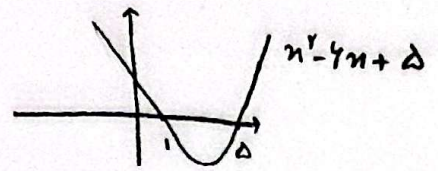
$$\text{الف) } \lim_{x \rightarrow 3^-} \frac{3(x)+1}{2} = \frac{3(3^-)+1}{2} = \frac{10}{2}$$

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

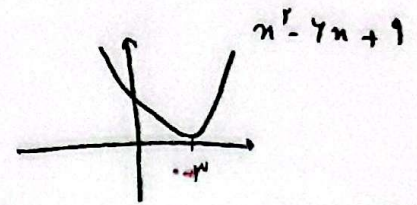
$$\text{ج) } \left[\lim_{x \rightarrow 3^-} \frac{3x+1}{2} \right] = [5] = 5$$

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

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



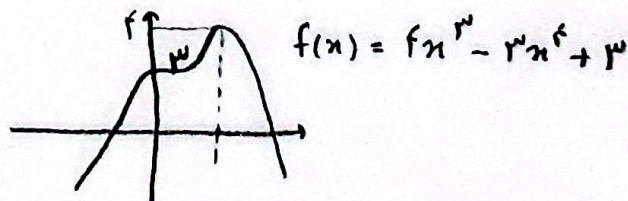
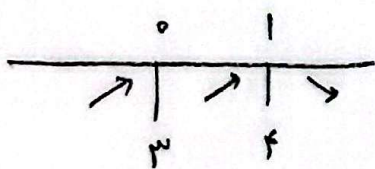
ب) $\lim_{x \rightarrow 3} \frac{x - f}{x^2 - 4x + 9} = \begin{cases} \xrightarrow{3^+} \frac{-1}{0^+} = -\infty \\ \xrightarrow{3^-} \frac{-1}{0^+} = -\infty \end{cases} \rightarrow \lim_{x \rightarrow 3} f(x) = -\infty$



الف) $\lim_{x \rightarrow -3} [-3x] - [\Delta x] = \begin{cases} \xrightarrow{(-3)^+} [9^-] - [(-1\Delta)^+] = 8 - (-1\Delta) = 23 \\ \xrightarrow{(-3)^-} [9^+] - [(-1\Delta)^-] = 9 - (-1\Delta) = 2\Delta \end{cases}$

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

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



ب) $\lim_{x \rightarrow 1} [f(x)] = [f^-] = 3$

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

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

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

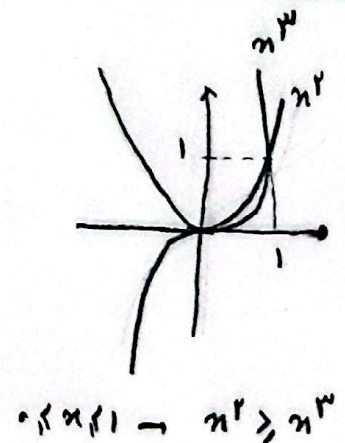
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$$\text{الف) } \lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x} \begin{cases} \xrightarrow{x \rightarrow \frac{\pi}{2}^-} \text{غير راديكال مفتوح} \\ \xrightarrow{x \rightarrow \frac{\pi}{2}^+} \sqrt{0^+} = 0 \end{cases}$$

$$\text{ب) } \lim_{x \rightarrow 0} \sqrt{x - 2\sqrt{x}} \begin{cases} \xrightarrow{x \rightarrow 0^+} \text{غير راديكال مفتوح} \\ \xrightarrow{x \rightarrow 0^-} \text{غير راديكال مفتوح} \end{cases} \quad \begin{aligned} D_f &= x \geq 0, \quad x \geq 2\sqrt{x} \\ &\rightarrow (\sqrt{x})^2 \geq 2\sqrt{x} \rightarrow \sqrt{x} \geq 2 \\ &\rightarrow x \geq 4 \end{aligned}$$

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

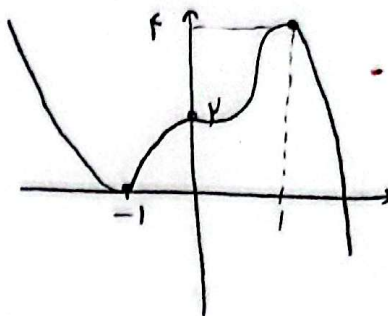
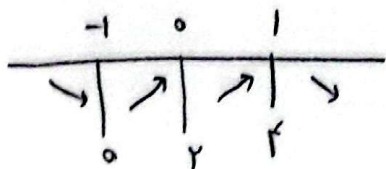
$$\rightarrow \frac{1}{0^-} = -\infty$$



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

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



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

