

الف)  $\lim_{x \rightarrow 2^+} \epsilon x - 3 = 1 - 3 = -2$

1

ب)  $\lim_{x \rightarrow 2^-} \epsilon x - 3 = 1 - 3 = -2$

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

$x \rightarrow 2^+ \Rightarrow x > 2 \Rightarrow [x] = 2$

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ب)  $\lim_{x \rightarrow 2^-} \epsilon [x] - 3 = \epsilon(1) - 3 = -2 = -2$

$x \rightarrow 2^- \Rightarrow 1 < x < 2 \Rightarrow [x] = 1$

الف)  $\lim_{x \rightarrow 2^+} [\epsilon x - 3] = -2$

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$x \rightarrow 2^+ \Rightarrow x > 2 \Rightarrow \epsilon x > 1 \Rightarrow \epsilon x - 3 > -2 \Rightarrow [\epsilon x - 3] = -2$

3

ب)  $\lim_{x \rightarrow 2^-} [\epsilon x - 3] = -3$

$x \rightarrow 2^- \Rightarrow x < 2 \Rightarrow \epsilon x < 1 \Rightarrow \epsilon x - 3 < -2 \Rightarrow [\epsilon x - 3] = -3$

الف)  $[\lim_{x \rightarrow 2^+} \epsilon x - 3] = [\epsilon(2) - 3] = [-2] = -2$

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ب)  $[\lim_{x \rightarrow 2^-} \epsilon x - 3] = [\epsilon(1) - 3] = [-3] = -3$

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الف)  $\lim_{x \rightarrow 0} \frac{\epsilon x - 3}{x - 3}$   
 $\begin{matrix} \nearrow \mu^+ & \frac{9}{0^+} = +\infty \\ \searrow \mu^- & \frac{9}{0^-} = -\infty \end{matrix}$

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ب)  $\lim_{x \rightarrow 0} \frac{\epsilon x - 3}{(x - 3)^2} = \frac{9}{(0)^2} = \frac{9}{0^+} = +\infty$

الف)  $\lim_{x \rightarrow 0} \frac{f(x) - f(0)}{\sqrt{x - 0}}$

$$\begin{aligned} & \xrightarrow{\mu^+} \frac{q}{\sqrt{0^+}} = \frac{q}{0^+} = +\infty \\ & \xrightarrow{\mu^-} \frac{q}{\sqrt{0^-}} = \frac{q}{x} = x \end{aligned}$$

صاف

ب)  $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{\sqrt{x^2 - 1}}$

$x^2 - 1 = 0 \Rightarrow \begin{cases} x = 1 \\ x = -1 \end{cases}$

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

$$\xrightarrow{\mu^-} \frac{q}{\sqrt{0^-}} = \frac{q}{x} = x$$

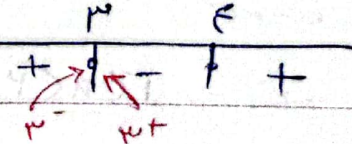
صاف

ج)  $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x^2 - 1}$

$x^2 - 1 = 0 \Rightarrow (x - 1)(x + 1) = 0$

$\Rightarrow \lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x^2 - 1} = \frac{q}{0^0}$

$$\begin{aligned} & \xrightarrow{\mu^+} \frac{q}{0^+} = -\infty \\ & \xrightarrow{\mu^-} \frac{q}{0^-} = +\infty \end{aligned}$$



د)  $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{[x - 1]}$

$$\begin{aligned} & \xrightarrow{\mu^+} \frac{q}{[0^+]} = \frac{q}{0^+} = 0 \\ & \xrightarrow{\mu^-} \frac{q}{[0^-]} = \frac{q}{-1} = -q \end{aligned}$$

الف)  $\lim_{u \rightarrow \mu} [f(u)] + [-f(u)]$

$u \rightarrow \mu^+ \Rightarrow u > \mu \Rightarrow f(u) > 9 \Rightarrow [f(u)] = 9$

$u \rightarrow \mu^+ \Rightarrow u > \mu \Rightarrow f(u) < 9 \Rightarrow -f(u) < -9 \Rightarrow [-f(u)] = -9$

$u \rightarrow \mu^- \Rightarrow u < \mu \Rightarrow f(u) < 9 \Rightarrow -f(u) > -9 \Rightarrow [-f(u)] = -9$

$u \rightarrow \mu^- \Rightarrow u < \mu \Rightarrow f(u) > 9 \Rightarrow [f(u)] = 9$

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$\Rightarrow \lim_{u \rightarrow \mu} [f(u)] + [-f(u)]$

$\begin{matrix} \mu^+ & 9 - 9 = 0 \\ \mu^- & 9 - 9 = 0 \end{matrix}$

صرت 0



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ب)  $\lim_{u \rightarrow -4} [-f(u)] + [f(u)]$

$u \rightarrow -4$

$\left\{ \begin{array}{l} u \rightarrow -4^+ \Rightarrow u > -4 \rightarrow \begin{cases} f(u) < -12 \rightarrow [f(u)] = -12 \\ -f(u) < 12 \rightarrow [-f(u)] = 12 \end{cases} \\ u \rightarrow -4^- \Rightarrow u < -4 \rightarrow \begin{cases} f(u) > -12 \rightarrow [f(u)] = -12 \\ -f(u) > 12 \rightarrow [-f(u)] = 12 \end{cases} \end{array} \right.$

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$\Rightarrow \lim_{u \rightarrow -4} [-f(u)] + [f(u)] \xrightarrow{-4^+} -12 + 12 = 0$

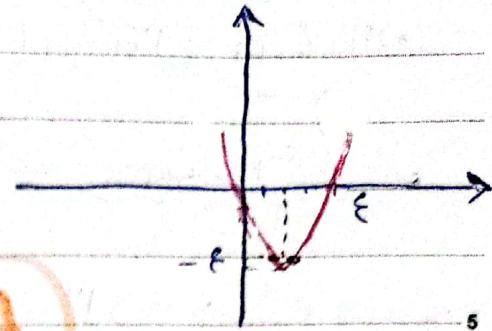
$\xrightarrow{-4^-} -12 + 12 = 0$

25

الف)  $\lim_{x \rightarrow 2} [x^2 - 4x] = [-4] = -4$

S |  $\begin{cases} -b/2a = \frac{-4}{2} = -2 \\ -\Delta/4a = -4/4 = -1 \end{cases}$

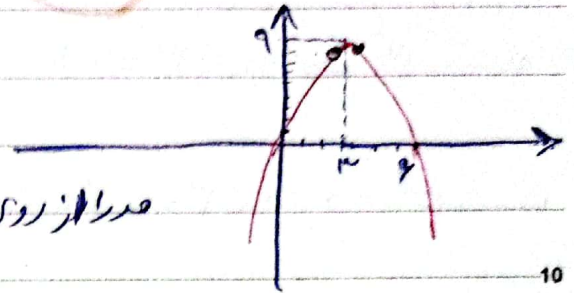
صدا از روی شکل می آید



ب)  $\lim_{x \rightarrow 3} [4x - x^2] = [9] = 9$

S |  $\begin{cases} -b/2a = \frac{-4}{-2} = 2 \\ -\Delta/4a = 9/4 = 2.25 \end{cases}$

صدا از روی شکل می آید



الف)  $\lim_{x \rightarrow 2} \frac{|x-2|}{x^2 - 3x + 2} = \frac{0}{0}$  رفع ابهام  $\rightarrow \lim_{x \rightarrow 2} \frac{|x-2|}{(x-2)(x-1)}$

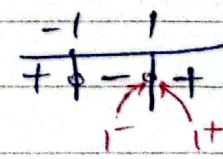
$\Rightarrow \lim_{x \rightarrow 2^+} \frac{(x-2)}{(x-2)(x-1)} = \frac{1}{x-1} = 1$

$\lim_{x \rightarrow 2^-} \frac{-(x-2)}{(x-2)(x-1)} = \lim_{x \rightarrow 2^-} \frac{-1}{x-1} = \frac{-1}{1} = -1$

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

$x^2 - 1 = 0 \Rightarrow (x-1)(x+1) = 0$   
 $x \rightarrow 1^+ \Rightarrow [x] = 1$   
 $x \rightarrow 1^- \Rightarrow [x] = 0$



$\Rightarrow \lim_{x \rightarrow 1} \frac{x - [x]}{x^2 - 1} \begin{cases} \lim_{x \rightarrow 1^+} \frac{x-1}{x^2-1} = \frac{0}{0} \text{ رفع ابهام} \rightarrow \lim_{x \rightarrow 1^+} \frac{x-1}{(x+1)(x-1)} = \frac{1}{2} \\ \lim_{x \rightarrow 1^-} \frac{x}{x^2-1} = \frac{1}{0^-} = -\infty \end{cases}$