

الف) $\lim_{x \rightarrow 2^+} \frac{2x+5}{x+1} = \frac{4}{3} = 1.33$ ✓

سوال ۱

(۱، ۵)

ب) $\lim_{x \rightarrow 2^-} \frac{2x+5}{x+1} = \frac{4}{3} = 1.33$ ✓

ج) $\lim_{x \rightarrow 2} \frac{2x+5}{x+1} = \frac{4}{3} = 1.33$ ✓

د) $\lim_{x \rightarrow 0} \frac{2x+7}{[x^2]} = \frac{7}{0^+} = +\infty$ ک. ن. حاصل برای آن عدد صحیح است و مخرج فقط صفر است.

دقیق است.

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

سوال ۲

ب) $\lim_{x \rightarrow 3^-} [5x - 2] = \lim_{x \rightarrow 3^-} [15 - 2] = \lim_{x \rightarrow 3^-} [13] = 13$ ✓

ج) $\left[\lim_{x \rightarrow 3^-} (2x - 2) \right] = \left[\lim_{x \rightarrow 3^-} (12 - 2) \right] = 10$ ✓

د) $\left[\lim_{x \rightarrow 3^+} Kx - 2 \right] = \left[\lim_{x \rightarrow 3^+} (12 - 2) \right] = 10$ ✓

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

سوال ۳

ب) $\lim_{x \rightarrow 3^-} \left[\frac{Kx+1}{2} \right] = \left[\frac{K(3^-)+1}{2} \right] = \left[\frac{10}{2} \right] = 5$ ✓

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

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

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الف) $\lim_{x \rightarrow 1} \frac{x-1}{x^2-2x+1} = \lim_{x \rightarrow 1} \frac{x-1}{(x-1)(x-1)} = \lim_{x \rightarrow 1} \frac{1}{x-1}$ سوال ۴

$\begin{array}{l} 1^+ \\ \swarrow \\ 1^- \end{array}$
 $\frac{1}{0^+} = +\infty$
 $\frac{1}{0^-} = -\infty$

حد ندارد

$\frac{1}{-1^+}$
 $\frac{1}{-1^-}$

۲

ب) $\lim_{x \rightarrow 3} \frac{x-3}{x^2-2x+4} = \lim_{x \rightarrow 3} \frac{x-3}{(x-3)^2}$

$\begin{array}{l} 3^+ \\ \swarrow \\ 3^- \end{array}$
 $\frac{x-3}{0^+} = -\infty$
 $\frac{x-3}{0^-} = -\infty$

الف) $\lim_{x \rightarrow -3} [-3x] - [5x]$

$\begin{array}{l} 1 \\ \swarrow \\ 1 \end{array}$
 $\begin{array}{l} 1 \\ \swarrow \\ 1 \end{array}$

سوال ۵

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$(-3)^+ \rightarrow 1 - (-10) = 11$
 $(-3)^- \rightarrow 1 - (-12) = 13$

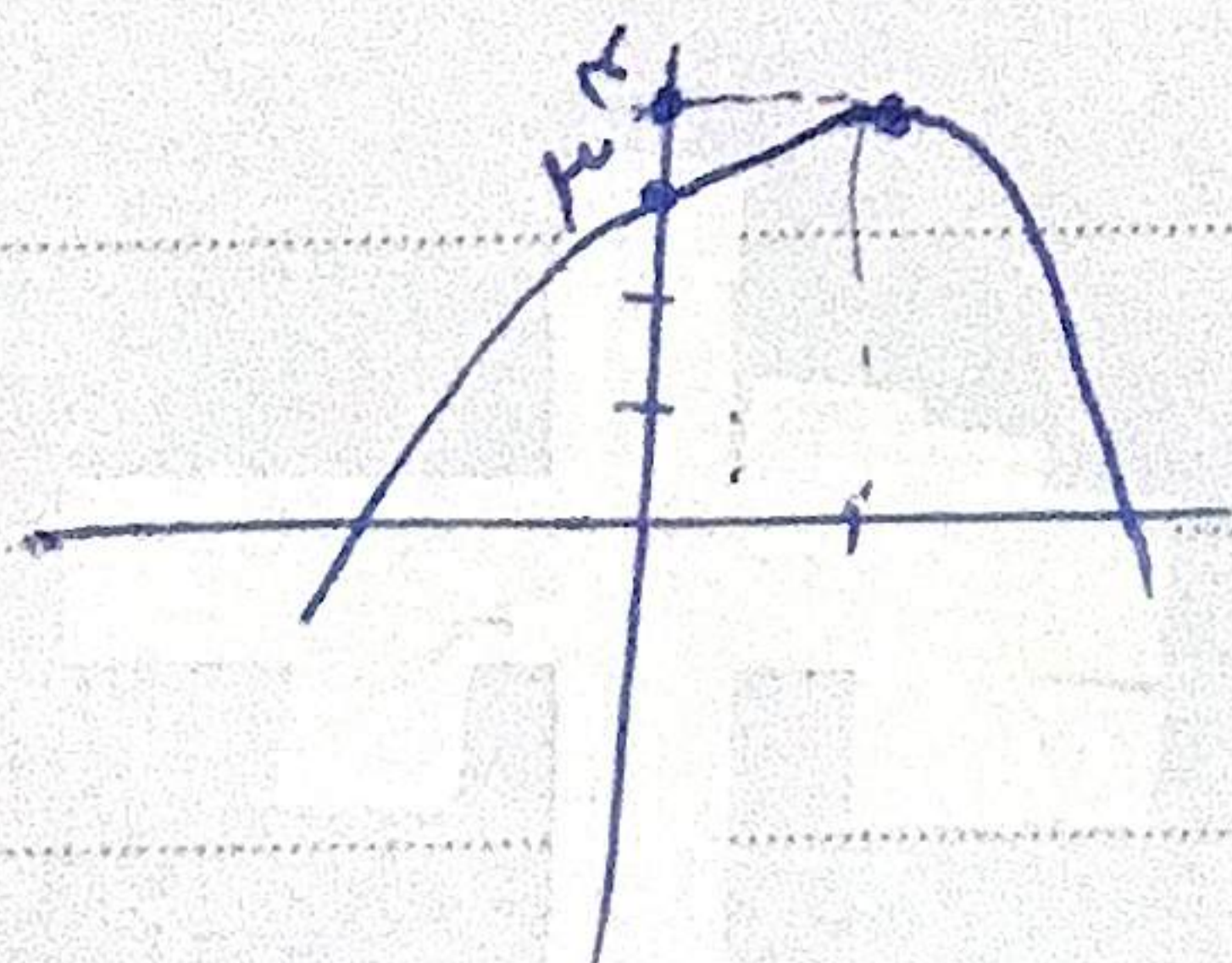
ب) $\lim_{x \rightarrow (-1/2)^-} \left[\frac{1}{x^2} \right] = -12$

$x < -\frac{1}{2} \rightarrow x^2 < \frac{1}{4} \rightarrow \frac{1}{x^2} > 4$
 $\rightarrow \frac{1}{x^2} > -12 \rightarrow \left[\frac{1}{x^2} \right] = -12$

الف) $\lim_{x \rightarrow 1} [-3x^4 + 4x^3 + 3] = 3$

سوال ۶

$-12x^3 + 12x^2 \xrightarrow{\text{تقسیم بر } (x-1)} -12x^2(x-1)$



جوابی: $x=1$ و کمتر از ۱ است

ب) $\lim_{x \rightarrow 0} [-3x^4 + 4x^3 + 3]$

$0^+ \rightarrow [3^+] = 3$
 $0^- \rightarrow [3^-] = 3$

باید به شکل ۰/۰ یا ۱/۱ باشد

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ii) $\lim_{x \rightarrow r} \frac{|x^r - 1|}{x^r - 1}$

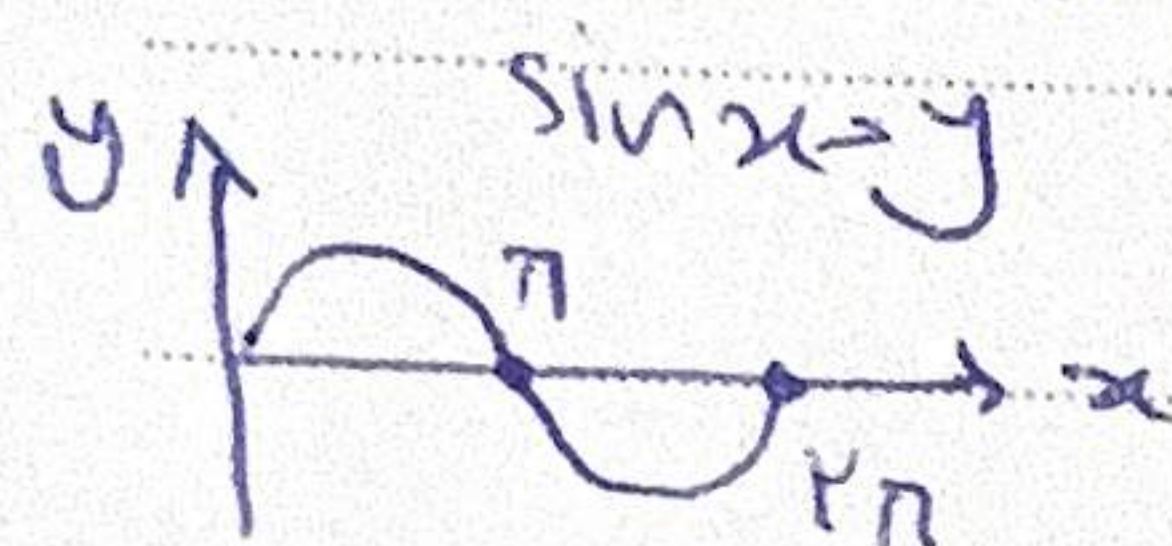
$r^+ \rightarrow \frac{(x-r)(x^r + \epsilon + rx)}{(x-r)(x+r)} = r$
 $r^- \rightarrow \frac{-(x-r)(x^r + \epsilon + rx)}{(x-r)(x+r)} = -r$

$x^r - 1 = (x-r)(x^r + \epsilon + rx)$
 $\frac{r}{-d+}$

وال ٢

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

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



iv) $\lim_{x \rightarrow \frac{3\pi}{2}} \sqrt{\cos x}$

$\frac{3\pi}{2}^- \rightarrow 0^-$
 $\frac{3\pi}{2}^+ \rightarrow 0^+$

وال ١

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

$0^- \rightarrow 0^-$
 $0^+ \rightarrow 0^+$

$\sqrt{x} \rightarrow x > 0$ ①
 $\sqrt{x - 2\sqrt{x}} \rightarrow x - 2\sqrt{x} > 0 \rightarrow \sqrt{x}(\sqrt{x} - 2) > 0 \rightarrow \sqrt{x} > 2 \rightarrow x > 4$ ②

① $\cap$ ② = $[4, +\infty) = 1$

vi) $\lim_{x \rightarrow 0^+} \frac{(-1)^{\lfloor \sin x \rfloor}}{x^r - x^r} = \lim_{x \rightarrow 0^+} \frac{(-1)^0}{x^r(x-1)} = \lim_{x \rightarrow 0^+} \frac{1}{x^r(x-1)} = \frac{1}{0^-} = -\infty$

وال ١

$x^r(x-1) > 0$
 $\frac{x}{-d-4+}$

وال ٢

vii) $\lim_{x \rightarrow r} \frac{x^r - [x^r]}{x - [x]}$

$r^+ \rightarrow \frac{x^r - \epsilon}{x - [x]} = \frac{(x+r)(x-r)}{(x-r)} = x+r = \epsilon$
 $r^- \rightarrow \frac{x-r}{x^r - r} = \frac{1}{1} = 1$

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الف) $y = -x^3 + 3x^2 + 2$

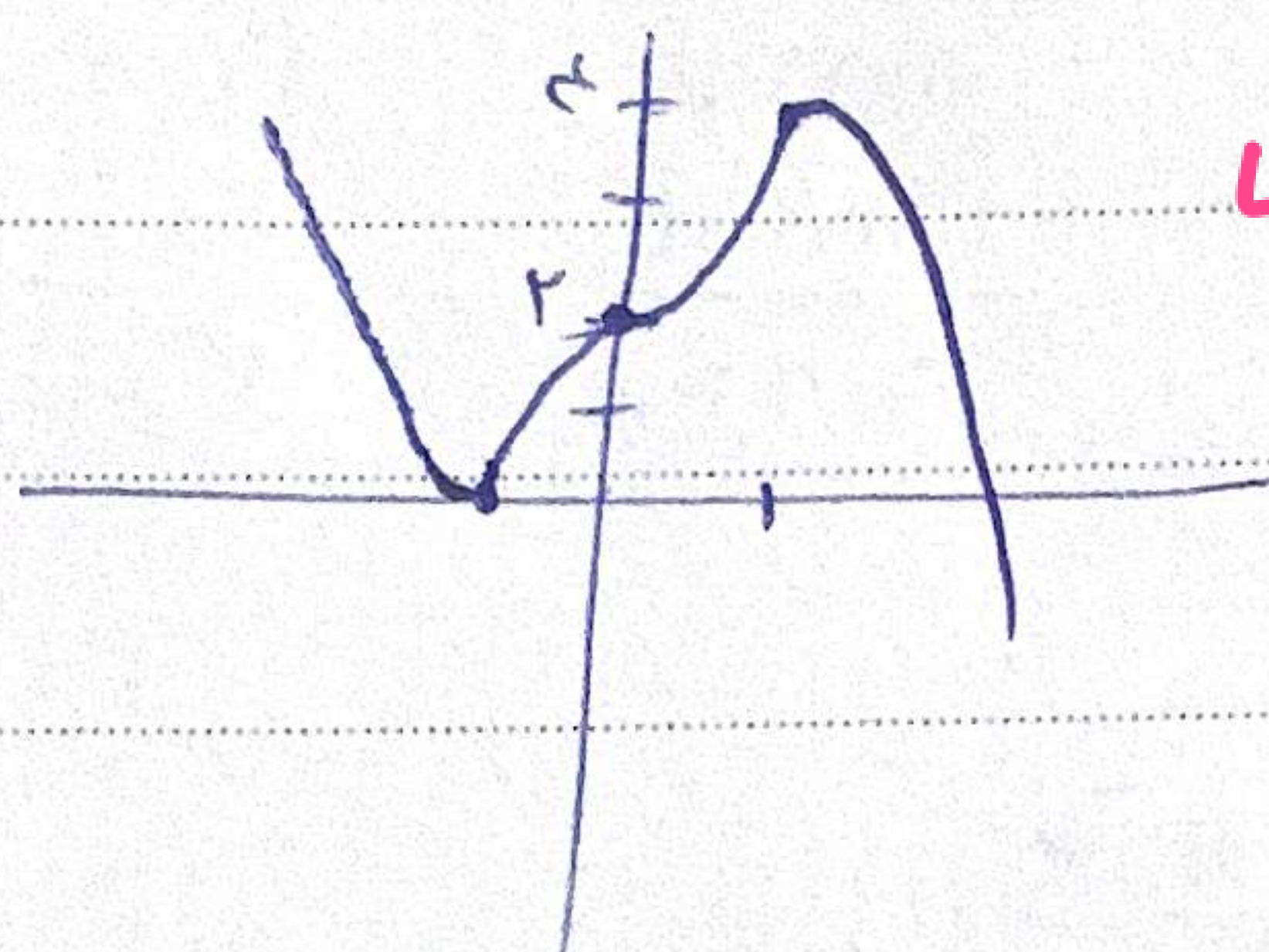
سوال 1

$$y' = -3x^2 + 6x = -3x^2(x-2) = -3x^2(x+1)(x-1)$$

⊙
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⊙

$$\begin{array}{c} -1 \quad * \quad 1 \\ \hline - \quad + \quad + \quad - \end{array}$$

$$f(1) = 2, f(-1) = 0, f(2) = 2$$



⊙

ب) $y = x^3 - 3x^2 + 3$ $y' = 3x^2 - 6x = 3x(x-2) = 3x(x-1)(x+1)$

⊙
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⊙

$$\begin{array}{c} -1 \quad * \quad 1 \\ \hline - \quad + \quad - \quad + \end{array}$$

$$f(1) = 1, f(2) = 3, f(-1) = 1$$

