

الف) $\lim_{x \rightarrow 2^+} \frac{2x+8}{x+1} = \frac{9}{3} = 3$ ✓

ب) $\lim_{x \rightarrow 2^-} \frac{2x+8}{x+1} = \frac{9}{3} = 3$ ✓

ج) $\lim_{x \rightarrow 2} \frac{2x+8}{x+1} = \frac{9}{3} = 3$ ✓

د) $\lim_{x \rightarrow 0} \frac{2x+7}{[x^2]} = \frac{7}{0}$ ← تعریف نشده ✓

(۲)

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

ب) $\lim_{x \rightarrow 0^-} [\varepsilon x - 2] = \lim_{x \rightarrow 0^-} [10] = 9$ ✓

ج) $\left[\lim_{x \rightarrow 0^-} \varepsilon x - 2 \right] = [10] = 10$ ✓

د) $\left[\lim_{x \rightarrow 0^+} \varepsilon x - 2 \right] = [10] = 10$ ✓

(۲)

الف) $\lim_{x \rightarrow 4} \frac{2[x]+1}{2} = \frac{9}{2}$ ✓

ب) $\lim_{x \rightarrow 4} \left[\frac{2x+1}{2} \right] = [5] = 4$ ✓

ج) $\left[\lim_{x \rightarrow 4} \frac{2x+1}{2} \right] = [5] = 5$ ✓

د) $\left[\lim_{x \rightarrow 4^+} \frac{2x+1}{2} \right] = [5] = 5$ ✓

(۲)

الف) $\lim_{x \rightarrow 1} \frac{x-8}{x^2-4x+8} \rightarrow \frac{(x-1)(x-8)}{1-4+8} = \frac{1-8}{1-4+8} = \frac{-7}{5}$
 $\left. \begin{array}{l} 1^+ \rightarrow \frac{-\varepsilon}{0^-} = +\infty \\ 1^- \rightarrow \frac{-\varepsilon}{0^+} = -\infty \end{array} \right\}$ حسی ✓

ب) $\lim_{x \rightarrow 3} \frac{x-8}{x^2-4x+9} \rightarrow \frac{(x-3)^2}{+1+9} = \frac{0}{10} = 0$
 $\left. \begin{array}{l} 3^+ \rightarrow \frac{-1}{0^+} = -\infty \\ 3^- \rightarrow \frac{-1}{0^+} = -\infty \end{array} \right\}$ حسی ✓

(۲)

الف) $\lim_{x \rightarrow -3} [-3x] - [8x] \xrightarrow{-3^+} \text{مقدار } (-2, 9) : [8, 9] - [-12, 8] = 8+12 = 20$
 $\xrightarrow{-3^-} \text{مقدار } (-3, 1) : [9, 1] - [-18, 8] = 9+14 = 23$ ✓

ب) $\lim_{x \rightarrow (-\frac{1}{4})^-} \left[\frac{-1}{x^4} \right] = [-14] = -14$

$\lim_{x \rightarrow (-\frac{1}{4})^-} \left[\frac{-1}{x^4} \right] = -14$

$x < -\frac{1}{4} \rightarrow \frac{1}{x} > -4 \rightarrow \frac{1}{x^4} > 14$
 $x < -\frac{1}{4} \rightarrow x^4 > \frac{1}{14} \rightarrow -x^4 < -\frac{1}{14} \rightarrow -\frac{1}{x^4} > -14$

(۱)

۵

الف) $\lim_{x \rightarrow 1} [\varepsilon x^3 - 3x^2 + 3] \xrightarrow{1^+} [\varepsilon^+ - 3 + 3] = [\varepsilon] = \varepsilon$
 $\xrightarrow{1^-} [1^- - 3 + 3] = [1^-] = 1$ } حصار

ب) $\lim_{x \rightarrow 0} [\varepsilon x^3 - 3x^2 + 3] \xrightarrow{0^+} [3] = 3$

6

الف) $\lim_{x \rightarrow 2} \frac{|x^3 - 8|}{x^2 - 4} = \lim_{x \rightarrow 2} \frac{|x-2|(x^2 + 4x + 8)}{(x-2)(x+2)} \xrightarrow{2^+} \frac{12}{4} = 3$
 $\xrightarrow{2^-} \frac{12}{4} = 3$ } حصار ✓

ب) $\lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin^2 x} = \lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin x \cos x} \xrightarrow{\pi^+} \frac{1}{-1} = -1$
 $\xrightarrow{\pi^-} \frac{1}{-1} = -1$ } حصار ✓

7

الف) $\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x} \xrightarrow{\frac{\pi}{2}^+} \sqrt{0^+} = 0$
 $\xrightarrow{\frac{\pi}{2}^-} \sqrt{0^-} = 0^-$ ✓

$x - \sqrt{x} \geq 0 \rightarrow \sqrt{x}(\sqrt{x} - 1) \geq 0 \rightarrow \frac{0}{+1-1+} \rightarrow x \geq 1 \leq x \leq 0$ (II)

ب) $\lim_{x \rightarrow 0} \sqrt{x - 2\sqrt{x}} \xrightarrow{0^+} \sqrt{0^+} = 0$

$x \geq 0$ (I)

$\lim_{x \rightarrow 0} \sqrt{x - 2\sqrt{x}} = \text{تعريف نشد}$
 $\xrightarrow{0^-} \sqrt{x - 2\sqrt{x}} = 0^-$

دامنه: $(I) \cap (II) \rightarrow x \geq 1 \leq x \leq 0$: هیچ آبع در نقاط اطراف صفر تعریف نشد.

1,8

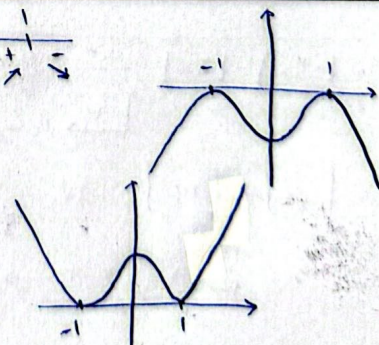
الف) $\lim_{x \rightarrow 0^+} \frac{(-1)^{[\sin x]}}{x^2 - x^2} = \lim_{x \rightarrow 0^+} \frac{1}{x^2(x-1)} = \frac{1}{0^-} = -\infty$ ✓

ب) $\lim_{x \rightarrow 2} \frac{x^2 - [x^2]}{x - [x]} \xrightarrow{2^+} \frac{x^2 - 4}{x - 2} = x + 2 = 6$
 $\xrightarrow{2^-} \frac{x^2 - 3}{x - 1} = \frac{1}{1} = 1$

9

الف) $y = 8x^3 - 3x^2 + 2 \rightarrow y' = 24x^2 - 6x$
 $12x^2(1-x)(1+x)$

ب) $y = x^3 - 2x^2 + 3 \rightarrow y' = 3x^2 - 4x$
 $3x(x-1)(n-1)$



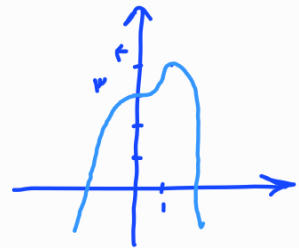
10

سؤال ٤

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

$y = f(x)^3 - 3x^2 + 3 \rightarrow y' = 3f(x)^2 - 6x \xrightarrow{y'=0} 3f(x)^2(1-x) = 0 \rightarrow \begin{cases} x=0 \\ x=1 \end{cases}$

x	$-\infty$	0	1	$+\infty$
y'		+	+	-
y		$\nearrow$	$\nearrow$	$\searrow$
		3	1	

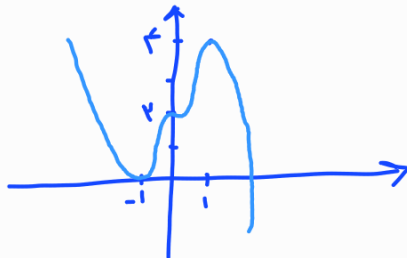


ب) $\lim_{x \rightarrow 0} [f(x)^3 - 3x^2 + 3] = \begin{cases} \lim_{x \rightarrow 0^+} [x^3] = 1 \\ \lim_{x \rightarrow 0^-} [x^3] = -1 \end{cases}$

الف) $y = 5x^3 - 3x^5 + 3$

$y' = 15x^2 - 15x^4 \xrightarrow{y'=0} 15x^2(1-x^2) = 0 \rightarrow 15x^2(1-x)(1+x) = 0 \rightarrow \begin{cases} x=0 \\ x=1 \\ x=-1 \end{cases}$

x	$-\infty$	-1	0	1	$+\infty$
y'	-	+	+	-	-
y		$\nearrow$	$\nearrow$	$\searrow$	
		3	3	1	



سؤال ١٠

ب) $y = x^4 - 2x^2 + 3$

$y' = 4x^3 - 4x \xrightarrow{y'=0} 4x(x^2-1) = 0 \rightarrow 4x(x-1)(x+1) = 0 \rightarrow \begin{cases} x=0 \\ x=1 \\ x=-1 \end{cases}$

x	$-\infty$	-1	0	1	$+\infty$
y'	-	+	-	+	+
y		$\nearrow$	$\searrow$	$\nearrow$	
		3	3	1	

