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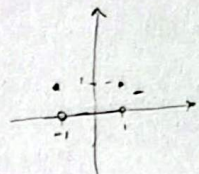
الف) $\lim_{n \rightarrow 2^+} \frac{2n+5}{n+1} = \lim_{n \rightarrow 2^+} \frac{2(2)+5}{(2)+1} = \frac{9}{3} = 3$

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

ج) $\lim_{n \rightarrow 2} \frac{2n+5}{n+1} = 3$

د) $\lim_{n \rightarrow 0} \frac{2n+5}{[n^2]} = \lim_{n \rightarrow 0} \frac{2n+5}{0} = \infty$ تعریف نشده

$\lim_{n \rightarrow 0} [x^2] = 0$



۲

الف) $\lim_{n \rightarrow 3^-} f(n) - 2 = \lim_{n \rightarrow 3^-} f(n) - 2 = 6$

ب) $\lim_{n \rightarrow 3^-} [f(n) - 2] = \lim_{n \rightarrow 3^-} [f(n)] - 2 = \lim_{n \rightarrow 3^-} [12] - 2 = 9$

ج) $\left[\lim_{n \rightarrow 3^-} f(n) - 2 \right] = \left[\lim_{n \rightarrow 3^-} f(n) - 2 \right] = [10] = 10$ و $\left[\lim_{n \rightarrow 3^+} f(n) - 2 \right] = \left[\lim_{n \rightarrow 3^+} f(n) - 2 \right] = [10] = 10$

۳

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

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

ج) $\left[\lim_{n \rightarrow 2^-} \frac{2n+1}{2} \right] = \left[\lim_{n \rightarrow 2^-} \frac{3}{2} \right] = [1.5] = 1$ و $\left[\lim_{n \rightarrow 2^+} \frac{2n+1}{2} \right] = \left[\lim_{n \rightarrow 2^+} \frac{5}{2} \right] = [2.5] = 2$

۴

الف) $\lim_{n \rightarrow 1} \frac{n-5}{n^2-n+5} = \lim_{n \rightarrow 1} \frac{n-5}{(n-5)(n+1)} = \lim_{n \rightarrow 1} \frac{1}{n+1} = \frac{1}{2}$

ب) $\lim_{n \rightarrow 3} \frac{n-2}{n^2-n+9} = \lim_{n \rightarrow 3} \frac{n-2}{(n-3)(n+3)} = \lim_{n \rightarrow 3} \frac{-1}{(n-3)^2} = -\infty$

در نقطه $x=1$ در دیندار است. $\lim_{n \rightarrow 1^+} \frac{1}{n-1} = +\infty$ و $\lim_{n \rightarrow 1^-} \frac{1}{n-1} = -\infty$ در $x=1$ در دیندار است.

۵

الف) $\lim_{n \rightarrow 2^-} [-f(n)] - [5n] = \lim_{n \rightarrow 2^-} [-f(n)] - [5n] = \lim_{n \rightarrow 2^-} [9^-] - [10^-] = 9 - 10 = -1$

ب) $\lim_{n \rightarrow 2^-} [-f(n)] - [5n] = \lim_{n \rightarrow 2^-} [9^+] - [10^+] = 9 - 10 = -1$

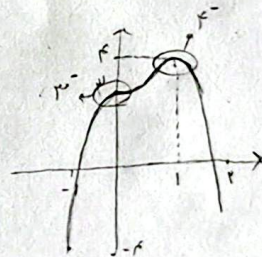
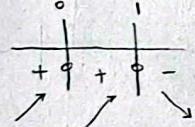
ج) $\lim_{n \rightarrow 2^-} \left[\frac{-1}{n^2} \right] = \lim_{n \rightarrow 2^-} \left[-\frac{1}{4} \right] = -1$

$x < \frac{1}{n^2} \Rightarrow n^2 < \frac{1}{x} \Rightarrow \frac{1}{x^2} < \frac{1}{x} \Rightarrow \frac{1}{n^2} > -1$

۶

الف) $\lim_{n \rightarrow 1} \frac{f(n^2 - 2n^2 + 3)}{f(n)} = \lim_{n \rightarrow 1} \frac{f(-n^2 + 3)}{f(n)} = 2$

$f'(n) = 12n^2 - 12n^2 = 12n^2(1-n)$



ب) $\lim_{n \rightarrow 0} [f(n^2 - 2n^2 + 3)] = \lim_{n \rightarrow 0} [3] = 3$

۷

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

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

در $x=2$ در دیندار است.

ب) $\lim_{n \rightarrow \pi} \frac{|\sin n|}{\sin n} = \lim_{n \rightarrow \pi} \frac{-\sin n}{\sin n} = \lim_{n \rightarrow \pi} \frac{-1}{1} = -1$

$\lim_{n \rightarrow \pi^-} \frac{|\sin n|}{\sin n} = \lim_{n \rightarrow \pi^-} \frac{\sin n}{\sin n} = 1$

در $x=\pi$ در دیندار است.

الف) $\lim_{n \rightarrow \frac{\pi}{2}} \sqrt{\cos n} \rightarrow \lim_{n \rightarrow \frac{\pi}{2}} \sqrt{\cos n} = 0$ ✓
 $\cos n \rightarrow 0$ $\Rightarrow$ $n = \frac{\pi}{2}$ در مخرج
 $\lim_{n \rightarrow \frac{\pi}{2}} \sqrt{\cos n} = 0$ تعریف نشده ✓
 $\cos n \rightarrow 0$ $\Rightarrow$ $n = \frac{\pi}{2}$ در مخرج

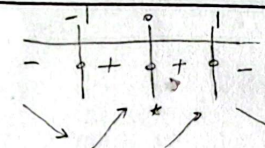
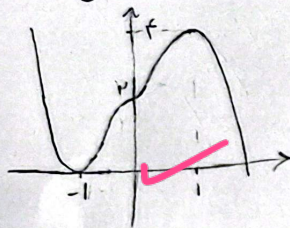
۱/۷۵

ب) $\lim_{n \rightarrow 0} \sqrt{n-2\sqrt{n}} = \lim_{n \rightarrow 0} \sqrt{(\sqrt{n}-1)^2 - 1}$ $\rightarrow \lim_{n \rightarrow 0^+} \sqrt{(\sqrt{n}-1)^2 - 1} = 0$ ✗
 $\lim_{n \rightarrow 0^+} \sqrt{(\sqrt{n}-1)^2 - 1} = 0$ تعریف نشده ✓
 $n \rightarrow 0^+$ $\Rightarrow$ $n = 0$ در مخرج

الف) $\lim_{n \rightarrow 0^+} \frac{(-1)^{[\sin n]}}{n^2 - n^2} = \lim_{n \rightarrow 0^+} \frac{(-1)^{[0^+]}}{n^2 - n^2} = \lim_{n \rightarrow 0^+} \frac{1}{n^2 - n^2} = -\infty$ ✓
 $n^2 - n^2 = n^2(n-1)$
 $n \rightarrow 0^+$ $\Rightarrow$ $n = 0$ در مخرج
 $\lim_{n \rightarrow 0^+} \frac{n^2 - [n^2]}{n - [n]} = \lim_{n \rightarrow 0^+} \frac{n^2 - f}{n - f} = \lim_{n \rightarrow 0^+} \frac{n^2 - f}{n - f} = \lim_{n \rightarrow 0^+} n + f = f$ ✓
 $\lim_{n \rightarrow 0^+} \frac{n^2 - [f]}{n - [f]} = \lim_{n \rightarrow 0^+} \frac{n^2 - f}{n - 1} = \frac{f - f}{f - 1} = 1$ ✗

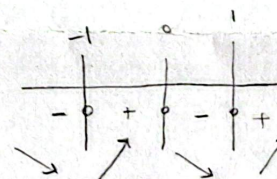
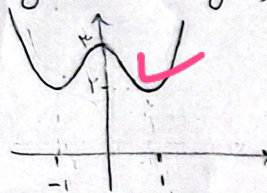
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الف) $y = \omega n^2 - 3n^2 + 2 = f(n)$ $f'(n) = 2\omega n - 6n = 2n(\omega - 3)$



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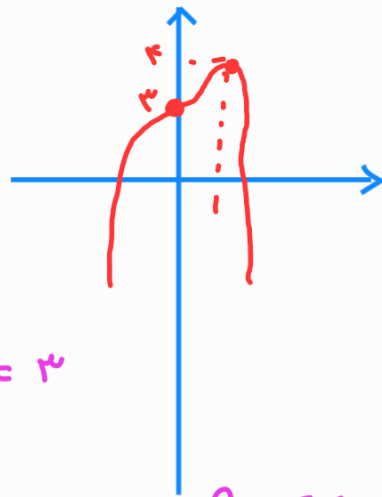
ب) $y = n^2 - 2n^2 + 3 = g(n)$ $g'(n) = 2n - 4n = -2n$



$$y = [\epsilon n^3 - 3n^2 + 3] \rightarrow y' = 3\epsilon n^2 - 6n \rightarrow y' = 0 \rightarrow 3\epsilon n^2(1-n) = 0 \quad -4$$

$n=0, n=1$

		*	
		.	
			1
y'	-	-	+
y	↘	↘	↗



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

ب) $\lim_{n \rightarrow 0} [\epsilon n^3 - 3n^2 + 3] = \begin{cases} n > 0 \rightarrow \lim[y] = [\epsilon^+] = 3 \\ n < 0 \rightarrow \lim[y] = [\epsilon^-] = 3 \end{cases}$

$$n - 2\sqrt{n} \geq 0 \rightarrow \sqrt{n}(\sqrt{n} - 2) \geq 0 \quad \begin{matrix} \sqrt{n} \leq 0 \\ \rightarrow n \geq 4 \end{matrix} \quad \text{II}$$

$\downarrow$

$n \geq 0 \quad \text{I}$

سوال ۸ - ب

$I \cap II \quad n=0 \leq n \geq 4 \rightarrow \text{تبراهان ضریف نه شد} \quad \lim_{n \rightarrow 0} \sqrt{n - 2\sqrt{n}} = \times$