

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

ب) $\lim_{n \rightarrow -\infty} \frac{2n+5}{n+1} = \frac{2 \times 2^- + 5}{2^- + 1} = \frac{9^-}{2^-} = 3^- = 3$

ج) $\lim_{n \rightarrow 2} \frac{2n+5}{n+1} = \frac{2 \times 2 + 5}{2 + 1} = \frac{9}{3} = 3$

د) $\lim_{n \rightarrow 0} \frac{2n+7}{[n^2]} = \begin{cases} 0^+ \rightarrow \frac{7}{0^+} \\ 0^- \rightarrow \frac{7}{0^-} \end{cases} \Rightarrow \text{تعریف نشده}$

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الف) $\lim_{n \rightarrow 3^-} 3[n] - 2 = 3 \times 2 - 2 = 4$

ب) $\lim_{n \rightarrow 3^-} [3n - 2] = [3 \times 3^- - 2] = [12^- - 2] = [10^-] = 9$

ج) $\lim_{n \rightarrow 3^-} [3n - 2] = \text{براکت باز} \Rightarrow 3 \times 3 - 2 = 7$

د) $\lim_{n \rightarrow 3^+} [3n - 2] = \text{براکت بسته} \Rightarrow 3 \times 3 - 2 = 7$

الف) $\lim_{n \rightarrow 3^-} \frac{3[n] + 1}{2} = \frac{3 \times 2 + 1}{2} = \frac{7}{2}$

$\frac{3 \times 3 + 1}{2} = \frac{10}{2} = 5$

ب) $\lim_{n \rightarrow 3^-} \left[\frac{3n+1}{2} \right] = \left[\frac{3 \times 3^- + 1}{2} \right] = \left[\frac{10^-}{2} \right] = [5^-] = 4$

ج) $\lim_{n \rightarrow 3^-} \left[\frac{3n+1}{2} \right] = \text{براکت باز} \Rightarrow \frac{3 \times 3 + 1}{2} = 5$

د) $\lim_{n \rightarrow 3^+} \left[\frac{3n+1}{2} \right] = \text{براکت بسته} \Rightarrow \frac{3 \times 3 + 1}{2} = 5$

الف) $\lim_{n \rightarrow 1} \frac{n-5}{n^2 - 4n + 5}$

$\frac{n-5}{(n-1)(n-4)}$

$\frac{1}{(1-1)(1-4)}$

$\frac{1}{0 \times -3} = \frac{1}{0}$

$\begin{cases} +\infty = \frac{1}{0^+} \in n \rightarrow 1^+ \\ -\infty = \frac{1}{0^-} \in n \rightarrow 1^- \end{cases}$

$\frac{1}{0^+} \rightarrow +\infty$ گروه اول
 $\frac{1}{0^-} \rightarrow -\infty$ گروه دوم

ب) $\lim_{n \rightarrow 3} \frac{n-4}{n^2 - 4n + 9} = \frac{n-4}{(n-3)^2} \xrightarrow{n \rightarrow 3} \frac{-1}{0^+} = -\infty$

الف) $\lim_{n \rightarrow -3} [-3n] - [5n] \xrightarrow{-3^+} [9^+] - [-15^+] = 9 - (-15) = 24$

$\xrightarrow{-3^-} [9^-] - [-15^-] = 9 - (-16) = 25$

ب) $\lim_{n \rightarrow (\frac{1}{4})^-} \left[\frac{1}{n^4} \right] = [16^+] = 16$

$n^2 = \frac{1}{4} \rightarrow n^4 > \frac{1}{16}$

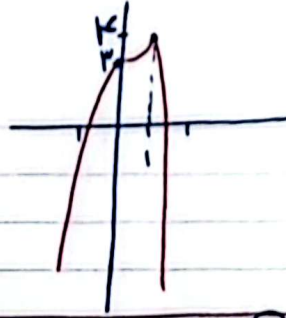
$\frac{1}{n^4} > 16 \Rightarrow \frac{1}{n^4} < 16$

الف) $\lim_{n \rightarrow 1} [4n^3 - 3n^2 + 3] = 4 - 3 + 3 = 4$ $\Rightarrow$ حول $n=1$ كعقار $n=1$ $\Rightarrow$ (3) ✓

ب) $\lim_{n \rightarrow 0} [4n^3 - 3n^2 + 3] = \begin{matrix} 0^+ \rightarrow 3^+ \\ 0^- \rightarrow 3^- \end{matrix} \Rightarrow 3$ $\Rightarrow$ (2)

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n	0	1
y	3	4



الف) $\lim_{x \rightarrow 2} \frac{|x^2 - 1|}{x^2 - 4} = \frac{2^+ \rightarrow (2-)(2^+ + 2^-)}{2^+ \rightarrow (2-)(2^+)} = \frac{2^+ + 2^-}{2^+} = 1$ $\Rightarrow$ (3) ✓

ب) $\lim_{n \rightarrow \pi} \frac{|\sin n|}{\sin 2n} = \begin{matrix} \pi^+ \rightarrow \frac{\sin n}{\sin 2n} = \frac{-1}{2 \cos n} = \frac{1}{2} \\ \pi^- \rightarrow \frac{\sin n}{\sin 2n} = \frac{+1}{2 \cos n} = -\frac{1}{2} \end{matrix}$ $\Rightarrow$ (3) ✓

الف) $\lim_{n \rightarrow \frac{\pi}{2}} \sqrt{\cos n} = \begin{matrix} \frac{\pi}{2}^+ \rightarrow \sqrt{0^+} = 0 \\ \frac{\pi}{2}^- \rightarrow \sqrt{0^-} = \text{تم رفضه} \end{matrix}$ $\Rightarrow$ (1)

ب) $\lim_{x \rightarrow 0} \sqrt{x - 2\sqrt{x}} = \begin{matrix} 0^+ \rightarrow \sqrt{0^+ - 2\sqrt{0^+}} = \sqrt{0^+ - 2 \cdot 0} = 0 \\ 0^- \rightarrow \sqrt{0^- - 2\sqrt{0^-}} = \text{تم رفضه} \end{matrix}$ $\Rightarrow$ (1)

الف) $\lim_{n \rightarrow 0^+} \frac{(-1)^{[\sin n]}}{n^3 - n^2} = \frac{-1^0}{n^2(n-1)} = \frac{-1}{n^2(n-1)} = \frac{+1}{0^+(-1)} = -\infty$ $\Rightarrow$ (9)

ب) $\lim_{n \rightarrow 1} \frac{n^2 - [n^2]}{n - [n]} = \begin{matrix} 1^+ \rightarrow \frac{n^2 - 4}{n - 4} = n + 4 = 5 \\ 1^- \rightarrow \frac{n^2 - 3}{n - 3} = \frac{1}{1} = 1 \end{matrix}$

الف) $y = 5n^3 - 3n^2 + 2 \rightarrow y' = 15n^2 - 6n$ ب) $y = n^3 - 2n^2 + 3 \rightarrow y' = 3n^2 - 4n$ (10)

