

الف) $\lim_{x \rightarrow 2^+} \frac{2x+5}{x+1}$ $\Rightarrow \frac{2^++5}{2^++1}$ $\hookrightarrow \frac{9^+}{3^+} = \lim_{x \rightarrow 3^+} x = 3$	ب) $\lim_{x \rightarrow 2^-} \frac{2x+5}{x+1}$ $\frac{2^-+5}{2^-+1} = \frac{7^-}{3^-}$ $\Rightarrow \lim_{x \rightarrow 3^-} x = 3$	ج) $\lim_{x \rightarrow 2} \frac{2x+5}{x+1}$ $\frac{2+5}{2+1} = \frac{7}{3}$ $\Rightarrow \lim_{x \rightarrow 3} x = 3$	د) $\lim_{x \rightarrow 0} \frac{2x+1}{[x^2]}$ $\Rightarrow x=0^+ \Rightarrow \frac{1}{0}$ $x=0^- \Rightarrow \frac{1}{0}$ حد ندارد زیرا خروجی بی‌نهایت	۱
$\lim_{n \rightarrow 1} f(n) = 2$ $\Rightarrow 1 \times 2 - 2 = 1 - 2 = -1$ $\Rightarrow \lim_{n \rightarrow 1} -1 = -1$	ب) $\lim_{n \rightarrow 1} [f(n) - 2]$ $\Rightarrow 1 - 2 = -1$ $\Rightarrow [1^-] = -1$ $\lim_{n \rightarrow 1} [1^-] = -1$	ج) $\lim_{n \rightarrow 3} [f(n) - 2]$ $n \rightarrow 3^-$ $1 \times 3 - 2 = 1$ $\lim_{n \rightarrow 3^-} 1 = 1$ $[1^-] = 1$	د) $\lim_{n \rightarrow 3} [f(n) - 2]$ $n \rightarrow 3^+$ $1 \times 3 - 2 = 1$ $\lim_{n \rightarrow 3^+} 1 = 1$ $[1^+] = 1$	۲
الف) $\lim_{n \rightarrow 3^-} \frac{3[n] + 1}{2}$ $\Rightarrow \frac{3 \times 2 + 1}{2} = \frac{7}{2}$	ب) $\lim_{n \rightarrow 3^-} \left[\frac{3n+1}{2} \right]$ $\Rightarrow \frac{9^-+1}{2} = \frac{10^-}{2} = 5^-$ $\lim_{n \rightarrow 3^-} [5^-] = 4$	ج) $\lim_{n \rightarrow 3^-} \left[\frac{3n+1}{2} \right]$ $\frac{9^-+1}{2} = 5^-$ $\lim_{n \rightarrow 3^-} 5^- = 5$ $[5] = 5$	د) $\lim_{n \rightarrow 3^+} \left[\frac{3n+1}{2} \right]$ $\frac{9^++1}{2} = 5^+$ $\lim_{n \rightarrow 3^+} 5^+ = 5$ $[5] = 5$	۳
الف) $\lim_{n \rightarrow 1} \frac{n-5}{n^2-4n+4} = \frac{n-5}{(n-2)(n-1)}$ $n \rightarrow 1^+ \Rightarrow \frac{-4^+}{-1^+ \times 0^+} = +\infty$ $n \rightarrow 1^- \Rightarrow \frac{-4^-}{-1^- \times 0^-} = +\infty$	ب) $\lim_{n \rightarrow 3} \frac{n-4}{n^2-4n+4} = \frac{n-4}{(n-2)^2}$ $n \rightarrow 3^+ \Rightarrow \frac{-1^+}{0^+} = -\infty$ $n \rightarrow 3^- \Rightarrow \frac{-1^-}{0^+} = -\infty$	۴		۴
الف) $\lim_{n \rightarrow -3} [-3n] - [5n] =$ $\Rightarrow n = -3^+ \Rightarrow [9^+] - [-15^+] = 9 + 15 = 24$ $n = -3^- \Rightarrow [9^-] - [-15^-] = 9 + 15 = 24$	ب) $\lim_{n \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{n^2} \right] \Rightarrow [14^+] = -14$	۵		۵

$\frac{1}{x} \rightarrow \infty$ as $x \rightarrow 0^+$

الف) $\lim_{n \rightarrow 1} [x n^3 - 2 n^2 + 3] \rightarrow \begin{cases} n=1^+ \rightarrow [x^+ - 2 + 3] = [1-2+3] = 2 \\ n=1^- \rightarrow [x^- - 2 + 3] = [1-2+3] = 2 \end{cases}$

$\Rightarrow \lim_{n \rightarrow 0} [x n^3 - 2 n^2 + 3] \rightarrow \begin{cases} n=0^+ \Rightarrow [x^+ - 0] = [x^+] = 2 \\ n=0^- \Rightarrow [x^- - 0] = [x^-] = 2 \end{cases}$

الف) $\lim_{n \rightarrow 2} \frac{|n^3 - 1|}{n^2 - 4}$

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

$\begin{cases} n=2^+ \Rightarrow \frac{|(2^+)^3 - 1|}{(2^+ - 2)(2^+ + 2)} \Rightarrow \frac{7}{0^+} = +\infty \\ n=2^- \Rightarrow \frac{|(2^-)^3 - 1|}{(2^- - 2)(2^- + 2)} = -\frac{7}{0^+} = -\infty \end{cases}$

$\Rightarrow \lim_{n \rightarrow 2} \frac{|n^3 - 1|}{n^2 - 4} = \begin{cases} n=2^+ \Rightarrow -\frac{1}{0^+} = -\infty \\ n=2^- \Rightarrow \frac{1}{0^+} = +\infty \end{cases}$

الف) $\lim_{n \rightarrow \frac{3x}{2}} \sqrt{an}$

$\Rightarrow \begin{cases} n=\frac{3x}{2}^+ = \sqrt{0^+} = 0^+ > 0 \\ n=\frac{3x}{2}^- = \sqrt{0^-} = 0^- < 0 \end{cases}$

ب) $\lim_{n \rightarrow 0} \sqrt{n - 2\sqrt{n}}$ $\sqrt{n} > 0 \Rightarrow n > 0$

$n - 2\sqrt{n} > 0 \Rightarrow n > 2\sqrt{n}$

$\Rightarrow n^2 > 4n \Rightarrow n > 4$

$\Rightarrow D_n = \{0\} \cup [4, +\infty)$

افراز 0 در نقطه 4 قرار دارد

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

$\Rightarrow \frac{(-1)^{[0]}}{n^2(n-1)} \Rightarrow \frac{1}{n^2(n-1)} \Rightarrow \frac{1}{0^+} = +\infty$

ب) $\lim_{n \rightarrow 2} \frac{n^2 - 4}{n - 2}$

$\begin{cases} n=2^+ \Rightarrow \frac{n^2 - 4}{n - 2} \Rightarrow n + 2 \Rightarrow 4 \\ n=2^- \Rightarrow \frac{n^2 - 4}{n - 2} \Rightarrow \frac{0^-}{0^-} = 1 \end{cases}$

الف) $y = \omega n^3 - 3 n^2 + 2$

$y' = 3\omega n^2 - 6n \Rightarrow 3\omega n^2(1 - n)$

در 3 نقطه 0، 1، -1 شیب صفر دارد

الف) $f(1) = \omega - 3 + 2 = \omega - 1$

$f(-1) = \omega + 3 + 2 = \omega + 5$

ب) $n^3 - 2n^2 + 3$

$y' = 3n^2 - 4n \Rightarrow 3n(n - \frac{4}{3})$

شیب 0 در 0، 1، -1