

بیان خدا

تالیف

کیوان مکارم نسب

$$الف) \lim_{n \rightarrow r^+} \frac{r_n + 2}{n+1} = \lim_{n \rightarrow r^+} \frac{r(r) + 2}{(r) + 1} = \frac{9}{4} = 2.25 \quad (1)$$

$$ب) \lim_{n \rightarrow r^-} \frac{r_n + 2}{n+1} = \lim_{n \rightarrow r^-} \frac{r(r) + 2}{(r) + 1} = \frac{9}{4} = 2.25$$

$$ج) \lim_{n \rightarrow r} \frac{r_n + 2}{n+1} = \lim_{n \rightarrow r} \frac{r(r) + 2}{(r) + 1} = \frac{9}{4} = 2.25$$

$$د) \lim_{n \rightarrow 0} \frac{r_n + 2}{[r^n]} \quad \left. \begin{array}{l} \xrightarrow{n \rightarrow 0^+} r > 0 \rightarrow r^2 > 0 \rightarrow [r^2] < 0 \\ \xrightarrow{n \rightarrow 0^-} r < 0 \rightarrow r^2 > 0 \rightarrow [r^2] < 0 \end{array} \right\} \rightarrow \text{حاصل مخرج و می شود 0 و این عبارت تعریف نشده و در نتیجه حد ندارد.}$$

$$الف) \lim_{n \rightarrow \infty} f(n) - 2 \quad \xrightarrow{n < 3} [n] = 2 \rightarrow \lim_{n \rightarrow \infty} f(r) - 2 = 1 - 2 = -1 \quad (2)$$

$$ب) \lim_{n \rightarrow \infty} [E_n - 2] \rightarrow n < 3 \rightarrow E_n < 3 \rightarrow E_n - 2 < 1 \rightarrow [E_n - 2] = 0 \rightarrow \lim_{n \rightarrow \infty} [E_n - 2] = 0$$

$$ج) \left[\lim_{n \rightarrow \infty} E_n - 2 \right] = \left[\lim_{n \rightarrow \infty} E(n) - 2 \right] = [10] = 10$$

$$د) \left[\lim_{n \rightarrow \infty} E_n - 2 \right] = \left[\lim_{n \rightarrow \infty} E(r) - 2 \right] = [10] = 10$$

$$الف) \lim_{n \rightarrow \infty} \frac{r[n] + 1}{r} \quad \xrightarrow{n < 3} \lim_{n \rightarrow \infty} \frac{r(r) + 1}{r} = \left(\frac{4}{3} \right) \quad (3)$$

$$ب) \lim_{n \rightarrow \infty} \left[\frac{r_n + 1}{r} \right] \rightarrow n < 3 \rightarrow r_n < 3 \rightarrow r_n + 1 < 4 \rightarrow \left[\frac{r_n + 1}{r} \right] = 1 \rightarrow \lim_{n \rightarrow \infty} \left[\frac{r_n + 1}{r} \right] = 1$$

$$ج) \left[\lim_{n \rightarrow \infty} \frac{r_n + 1}{r} \right] \Rightarrow \left[\lim_{n \rightarrow \infty} \frac{r(r) + 1}{r} \right] = \left[\lim_{n \rightarrow \infty} 1 \right] = 1$$

$$د) \left[\lim_{n \rightarrow \infty} \frac{r_n + 1}{r} \right] = \left[\lim_{n \rightarrow \infty} \frac{r(r) + 1}{r} \right] = \left[\lim_{n \rightarrow \infty} 1 \right] = 1$$

الف) $\lim_{n \rightarrow 1} \frac{n-1}{(n-1)(n-1)} = \lim_{n \rightarrow 1} \frac{1}{n-1}$ $\xrightarrow{n \rightarrow 1^+} \lim_{n \rightarrow 1^+} \frac{1}{n-1} = +\infty$ $\xrightarrow{n \rightarrow 1^-} \lim_{n \rightarrow 1^-} \frac{1}{n-1} = -\infty$ $\rightarrow$ حد ندارد (E)

ب) $\lim_{n \rightarrow 1} \frac{n-1}{(n-1)^2}$ $\xrightarrow{n \rightarrow 1^+} \lim_{n \rightarrow 1^+} \frac{1}{n-1} = +\infty$ $\xrightarrow{n \rightarrow 1^-} \lim_{n \rightarrow 1^-} \frac{1}{n-1} = -\infty$ $\rightarrow$ حد ندارد

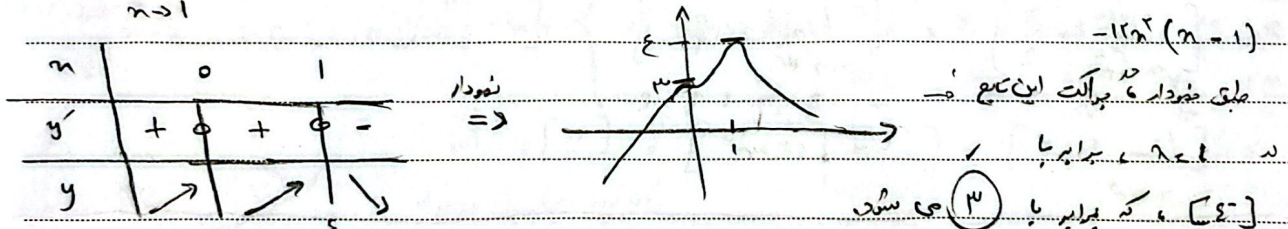
الف) $\lim_{n \rightarrow -3} [-3n] = [\omega n]$ $\textcircled{1} n \rightarrow -3^+ \rightarrow n > -3 \rightarrow 3n < -9 \rightarrow -3n < 9 \rightarrow [-3n] = 9$ $\textcircled{2} n \rightarrow -3^- \rightarrow n < -3 \rightarrow 3n < -9 \rightarrow -3n > 9 \rightarrow [-3n] = 9$ $\textcircled{3} n \rightarrow -3 \rightarrow 3n = -9 \rightarrow -3n = 9 \rightarrow [-3n] = 9$

$\textcircled{1} n \rightarrow -3^+ \rightarrow n < -3 \rightarrow 3n < -9 \rightarrow -3n > 9 \rightarrow [-3n] = 9$
 $n < -3 \rightarrow 3n < -9 \rightarrow [3n] = -10 \rightarrow 9 - (-10) = 19$

$\textcircled{1, 2} n \rightarrow -3 \rightarrow 3n = -9 \rightarrow -3n = 9 \rightarrow [-3n] = 9$

ب) $\lim_{n \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{n^2} \right]$ $\rightarrow n < -\frac{1}{2} \rightarrow -\frac{1}{n^2} < -4 \rightarrow \frac{-1}{n^2} < -4 \rightarrow \frac{-1}{n^2} < -4$
 $\rightarrow \left[\frac{-1}{n^2} \right] = -4 \rightarrow \lim_{n \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{n^2} \right] = -4 \checkmark$

الف) $\lim_{n \rightarrow 1} [5n^3 - 3n^2 + 3]$ $\rightarrow y = 5n^3 - 3n^2 + 3 \rightarrow y' = 15n^2 - 6n = 3n(5n - 2)$ (6)



ب) $\lim_{n \rightarrow 0} [5n^3 - 3n^2 + 3]$ $\rightarrow$ نمودار $\Rightarrow$ $\textcircled{1} n \rightarrow 0^+ \rightarrow f(n) = 3^+ \textcircled{2} n \rightarrow 0^- \rightarrow f(n) = 3^-$
 $\rightarrow \lim_{n \rightarrow 0^+} [f(n)] = 3$
 $\rightarrow \lim_{n \rightarrow 0^-} [f(n)] = 3$ $\rightarrow$ حد ندارد $\times$

الف) $\lim_{n \rightarrow 2} \frac{n^2-4}{n^2-2} \rightarrow \lim_{n \rightarrow 2} \frac{(n-2)(n+2)}{(n-2)(n+2)} = \lim_{n \rightarrow 2} \frac{n+2}{n+2} = 1$ (7)

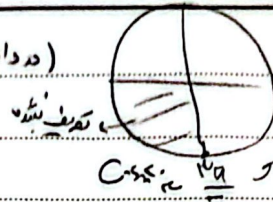
ب) $\lim_{n \rightarrow 2} \frac{n^2-4}{n^2-2} \rightarrow \lim_{n \rightarrow 2} \frac{(n-2)(n+2)}{(n-2)(n+2)} = \lim_{n \rightarrow 2} \frac{n+2}{n+2} = 1$ $\rightarrow$ حد ندارد $\times$

الف) $\lim_{n \rightarrow 0} \frac{|\sin n|}{\sin n}$ $\xrightarrow{n \rightarrow 0^+} \lim_{n \rightarrow 0^+} \frac{\sin n}{\sin n} = 1$ $\xrightarrow{n \rightarrow 0^-} \lim_{n \rightarrow 0^-} \frac{-\sin n}{\sin n} = -1$ $\rightarrow$ حد ندارد

ب) $\lim_{n \rightarrow 0} \frac{\sin n}{\sin n} = \lim_{n \rightarrow 0} \frac{\sin n}{\sin n} = 1$ $\rightarrow$ حد ندارد $\times$

الف) $\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x}$ (در دامنه نیست) $\xrightarrow{x \rightarrow \frac{\pi}{2}^-}$ تعریف نشده $\xrightarrow{x \rightarrow \frac{\pi}{2}^+}$ تعریف نشده

$\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x} = 0 \checkmark$



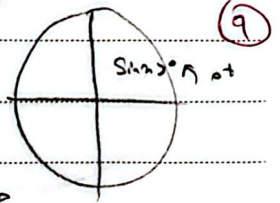
$\cos \frac{\pi}{2} = \cos x$

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ب) $\lim_{n \rightarrow \infty} \sqrt{n - \sqrt{n}}$ $DF = [0, +\infty)$ $n \geq 0$ فقط در حد راست $n \rightarrow 0^+$ $\lim_{n \rightarrow 0^+} \sqrt{n - \sqrt{n}} = 0 \checkmark$

الف) $\lim_{x \rightarrow 0^+} \frac{(-1)^{\lfloor \sin x \rfloor}}{x^2 - 2}$ $0 < \sin x < \pi$ $\lim_{x \rightarrow 0^+} \frac{1}{x^2(n-1)}$

$\lim_{x \rightarrow 0^+} \frac{1}{0^-} = -\infty \checkmark$ (در حد راست) $x < 0$ $\lim_{x \rightarrow 0^-} \frac{1}{0^+} = +\infty$



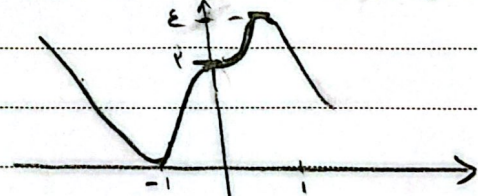
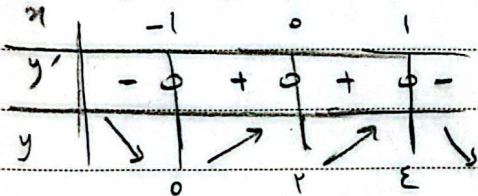
ب) $\lim_{x \rightarrow 2} \frac{x^2 - \lfloor x^2 \rfloor}{x - \lfloor x \rfloor}$ $x \rightarrow 2^+$ $x > 2 \rightarrow x^2 > 4 \rightarrow \lfloor x^2 \rfloor = 4$ $\lfloor x \rfloor = 2$

① $\lim_{x \rightarrow 2^+} \frac{x^2 - 4}{x - 2} = \lim_{x \rightarrow 2^+} \frac{(x-2)(x+2)}{x-2} = \lim_{x \rightarrow 2^+} (x+2) = 4 \checkmark$

② $x \rightarrow 2^-$ $x < 2 \rightarrow x^2 < 4 \rightarrow \lfloor x^2 \rfloor = 3$ $\lfloor x \rfloor = 1$

$\lim_{x \rightarrow 2^-} \frac{x^2 - 3}{x - 1} = \frac{4^2 - 3}{2 - 1} = 13 \checkmark$

الف) $y = -\frac{1}{2}x^2 + 2x^2 + 2$ $y' = -1x + 4x = 3x$ $y'' = 3$ $y''' = 0$ $y^{(4)} = 0$ $y^{(5)} = 0$ $y^{(6)} = 0$ $y^{(7)} = 0$ $y^{(8)} = 0$ $y^{(9)} = 0$ $y^{(10)} = 0$ $y^{(11)} = 0$ $y^{(12)} = 0$ $y^{(13)} = 0$ $y^{(14)} = 0$ $y^{(15)} = 0$ $y^{(16)} = 0$ $y^{(17)} = 0$ $y^{(18)} = 0$ $y^{(19)} = 0$ $y^{(20)} = 0$ $y^{(21)} = 0$ $y^{(22)} = 0$ $y^{(23)} = 0$ $y^{(24)} = 0$ $y^{(25)} = 0$ $y^{(26)} = 0$ $y^{(27)} = 0$ $y^{(28)} = 0$ $y^{(29)} = 0$ $y^{(30)} = 0$ $y^{(31)} = 0$ $y^{(32)} = 0$ $y^{(33)} = 0$ $y^{(34)} = 0$ $y^{(35)} = 0$ $y^{(36)} = 0$ $y^{(37)} = 0$ $y^{(38)} = 0$ $y^{(39)} = 0$ $y^{(40)} = 0$ $y^{(41)} = 0$ $y^{(42)} = 0$ $y^{(43)} = 0$ $y^{(44)} = 0$ $y^{(45)} = 0$ $y^{(46)} = 0$ $y^{(47)} = 0$ $y^{(48)} = 0$ $y^{(49)} = 0$ $y^{(50)} = 0$ $y^{(51)} = 0$ $y^{(52)} = 0$ $y^{(53)} = 0$ $y^{(54)} = 0$ $y^{(55)} = 0$ $y^{(56)} = 0$ $y^{(57)} = 0$ $y^{(58)} = 0$ $y^{(59)} = 0$ $y^{(60)} = 0$ $y^{(61)} = 0$ $y^{(62)} = 0$ $y^{(63)} = 0$ $y^{(64)} = 0$ $y^{(65)} = 0$ $y^{(66)} = 0$ $y^{(67)} = 0$ $y^{(68)} = 0$ $y^{(69)} = 0$ $y^{(70)} = 0$ $y^{(71)} = 0$ $y^{(72)} = 0$ $y^{(73)} = 0$ $y^{(74)} = 0$ $y^{(75)} = 0$ $y^{(76)} = 0$ $y^{(77)} = 0$ $y^{(78)} = 0$ $y^{(79)} = 0$ $y^{(80)} = 0$ $y^{(81)} = 0$ $y^{(82)} = 0$ $y^{(83)} = 0$ $y^{(84)} = 0$ $y^{(85)} = 0$ $y^{(86)} = 0$ $y^{(87)} = 0$ $y^{(88)} = 0$ $y^{(89)} = 0$ $y^{(90)} = 0$ $y^{(91)} = 0$ $y^{(92)} = 0$ $y^{(93)} = 0$ $y^{(94)} = 0$ $y^{(95)} = 0$ $y^{(96)} = 0$ $y^{(97)} = 0$ $y^{(98)} = 0$ $y^{(99)} = 0$ $y^{(100)} = 0$



ب) $y = x^2 - 2x^2 + 2$ $y' = 2x - 4x = -2x$ $y'' = -2$ $y''' = 0$ $y^{(4)} = 0$ $y^{(5)} = 0$ $y^{(6)} = 0$ $y^{(7)} = 0$ $y^{(8)} = 0$ $y^{(9)} = 0$ $y^{(10)} = 0$ $y^{(11)} = 0$ $y^{(12)} = 0$ $y^{(13)} = 0$ $y^{(14)} = 0$ $y^{(15)} = 0$ $y^{(16)} = 0$ $y^{(17)} = 0$ $y^{(18)} = 0$ $y^{(19)} = 0$ $y^{(20)} = 0$ $y^{(21)} = 0$ $y^{(22)} = 0$ $y^{(23)} = 0$ $y^{(24)} = 0$ $y^{(25)} = 0$ $y^{(26)} = 0$ $y^{(27)} = 0$ $y^{(28)} = 0$ $y^{(29)} = 0$ $y^{(30)} = 0$ $y^{(31)} = 0$ $y^{(32)} = 0$ $y^{(33)} = 0$ $y^{(34)} = 0$ $y^{(35)} = 0$ $y^{(36)} = 0$ $y^{(37)} = 0$ $y^{(38)} = 0$ $y^{(39)} = 0$ $y^{(40)} = 0$ $y^{(41)} = 0$ $y^{(42)} = 0$ $y^{(43)} = 0$ $y^{(44)} = 0$ $y^{(45)} = 0$ $y^{(46)} = 0$ $y^{(47)} = 0$ $y^{(48)} = 0$ $y^{(49)} = 0$ $y^{(50)} = 0$ $y^{(51)} = 0$ $y^{(52)} = 0$ $y^{(53)} = 0$ $y^{(54)} = 0$ $y^{(55)} = 0$ $y^{(56)} = 0$ $y^{(57)} = 0$ $y^{(58)} = 0$ $y^{(59)} = 0$ $y^{(60)} = 0$ $y^{(61)} = 0$ $y^{(62)} = 0$ $y^{(63)} = 0$ $y^{(64)} = 0$ $y^{(65)} = 0$ $y^{(66)} = 0$ $y^{(67)} = 0$ $y^{(68)} = 0$ $y^{(69)} = 0$ $y^{(70)} = 0$ $y^{(71)} = 0$ $y^{(72)} = 0$ $y^{(73)} = 0$ $y^{(74)} = 0$ $y^{(75)} = 0$ $y^{(76)} = 0$ $y^{(77)} = 0$ $y^{(78)} = 0$ $y^{(79)} = 0$ $y^{(80)} = 0$ $y^{(81)} = 0$ $y^{(82)} = 0$ $y^{(83)} = 0$ $y^{(84)} = 0$ $y^{(85)} = 0$ $y^{(86)} = 0$ $y^{(87)} = 0$ $y^{(88)} = 0$ $y^{(89)} = 0$ $y^{(90)} = 0$ $y^{(91)} = 0$ $y^{(92)} = 0$ $y^{(93)} = 0$ $y^{(94)} = 0$ $y^{(95)} = 0$ $y^{(96)} = 0$ $y^{(97)} = 0$ $y^{(98)} = 0$ $y^{(99)} = 0$ $y^{(100)} = 0$

