

۲) سری

تکلیف ۱

پروگرام مقیم ۱۴

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

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

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

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

1 Oct. 2024
1446 ربيع الاول 27

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) $\lim_{n \rightarrow 3^-} [3n - 2] = \text{براکت چپ} \Rightarrow 3 \times 3^- - 2 = 10^- = 9$ ✓

د) $\lim_{n \rightarrow 3^+} [3n - 2] = \text{براکت راست} \Rightarrow 3 \times 3^+ - 2 = 10^+ = 10$ ✓

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

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

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) $\lim_{n \rightarrow 3^-} \left[\frac{3n+1}{2} \right] = \text{براکت چپ} \Rightarrow \frac{3 \times 3^- + 1}{2} = 5^- = 4$ ✓

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

الف) $\lim_{n \rightarrow 1} \frac{n-5}{n^2 - 6n + 5}$

$\lim_{n \rightarrow 1} \frac{n-5}{(n-1)(n-5)} = \frac{1-5}{(1-1)(1-5)}$

$\lim_{n \rightarrow 1} \frac{1}{n-1} = \frac{1}{0} = \infty$ ✓

در حد اول $\frac{1}{0^+} = +\infty$ $\frac{1}{0^-} = -\infty$ $\frac{1}{0} = \infty$ $\frac{1}{0} = -\infty$

ب) $\lim_{n \rightarrow 3} \frac{n-4}{n^2 - 6n + 9} = \frac{n-4}{(n-3)^2} \xrightarrow{n \rightarrow 3} \frac{-1}{0^+} = -\infty$ ✓

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

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

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

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

$\frac{1}{n^4} > 4 \leftarrow \frac{1}{n^4} < 4$

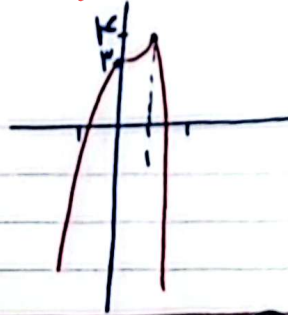
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الف) $\lim_{n \rightarrow 1} [4n^3 - 3n^2 + 3] = 4 - 3 + 3 = 4$ $\Rightarrow$ $\text{نوع } 0/0$ $\Rightarrow$ قانون ل'Hopital $\Rightarrow$ $\lim_{n \rightarrow 1} [12n^2 - 6n] = 12 - 6 = 6$ $\Rightarrow$ $\text{جواب } 6$ $\checkmark$

ب) $\lim_{n \rightarrow 0} [4n^3 - 3n^2 + 3] = 0 - 0 + 3 = 3$ $\Rightarrow$ $\text{جواب } 3$ $\checkmark$

2 Oct. 2024
12:26 ربيع الاول 1446

n	0	1
y	3	6



الف) $\lim_{x \rightarrow 2} \frac{|x^2 - 1|}{x^2 - 4} = \lim_{x \rightarrow 2} \frac{(x-1)(x+1)}{(x-2)(x+2)} = \frac{1 \cdot 3}{0 \cdot 4} = \infty$ $\Rightarrow$ $\text{جواب } \infty$ $\checkmark$

ب) $\lim_{n \rightarrow \pi} \frac{|\sin n|}{\sin 2n} = \frac{0}{0}$ $\Rightarrow$ قانون ل'Hopital $\Rightarrow$ $\lim_{n \rightarrow \pi} \frac{-\cos n}{2 \cos 2n} = \frac{-(-1)}{2 \cos 2\pi} = \frac{1}{2}$ $\Rightarrow$ $\text{جواب } \frac{1}{2}$ $\checkmark$

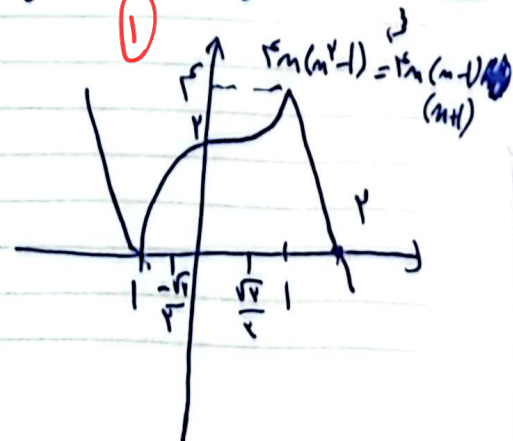
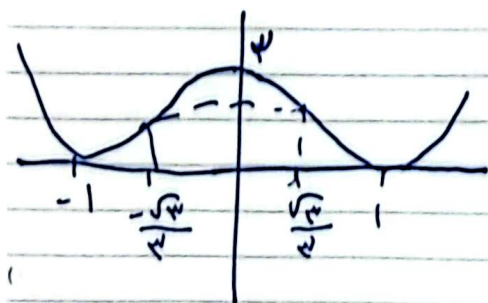
الف) $\lim_{n \rightarrow \frac{\pi}{2}} \sqrt{\cos n} = \sqrt{0} = 0$ $\Rightarrow$ $\text{جواب } 0$ $\checkmark$

ب) $\lim_{x \rightarrow 0} \sqrt{x - 2\sqrt{x}} = \sqrt{0 - 0} = 0$ $\Rightarrow$ $\text{جواب } 0$ $\checkmark$

الف) $\lim_{n \rightarrow 0^+} \frac{(-1)^n \sin n}{n^3 - n^2} = \frac{-1 \cdot 0}{0 - 0} = \frac{0}{0}$ $\Rightarrow$ قانون ل'Hopital $\Rightarrow$ $\lim_{n \rightarrow 0^+} \frac{-\cos n}{3n^2 - 2n} = \frac{-1}{0} = \infty$ $\Rightarrow$ $\text{جواب } \infty$ $\checkmark$

ب) $\lim_{n \rightarrow 1} \frac{n^2 - [n^2]}{n - [n]} = \frac{0}{0}$ $\Rightarrow$ قانون ل'Hopital $\Rightarrow$ $\lim_{n \rightarrow 1} \frac{2n - 2n}{1 - 1} = \frac{0}{0}$ $\Rightarrow$ $\text{جواب } 1$ $\checkmark$

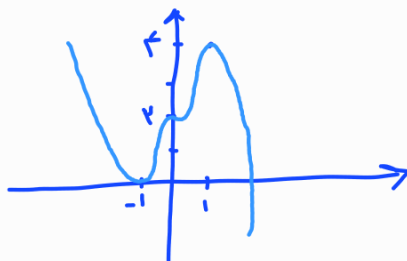
الف) $y = 5n^3 - 3n^2 + 2 \rightarrow y' = 15n^2 - 6n$ $\Rightarrow$ $\text{ب) } y = n^3 - 2n^2 + 3 \rightarrow y' = 3n^2 - 4n$ $\Rightarrow$ $\text{جواب } 15n^2 - 6n$ $\checkmark$



الف) $y = 5x^3 - 12x^2 + 7$

$$y' = 15x^2 - 24x \xrightarrow{y'=0} 15x^2(1-1.6x) = 0 \rightarrow 15x^2(1-x)(1+0.6x) = 0 \rightarrow \begin{cases} x=0 \\ x=1 \\ x=-1 \end{cases}$$

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



سؤال 10

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	$\searrow$	$\nearrow$	$\searrow$	$\nearrow$	

