

1) الف) $\lim_{n \rightarrow r^+} \frac{r_{n+1}}{n+1} \Rightarrow \frac{a}{r} = \boxed{r}$ ب) $\lim_{n \rightarrow r^-} \frac{r_{n+1}}{n+1} = \boxed{r}$

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ج) $\lim_{n \rightarrow r} \frac{r_{n+1}}{n+1} \rightarrow \begin{matrix} n \rightarrow r^+ = \boxed{r} \\ n \rightarrow r^- = \boxed{r} \end{matrix} \rightarrow \text{محدود} \Rightarrow \boxed{r}$

د) $\lim_{n \rightarrow 0} \frac{r_{n+1}}{[n^r]} \rightarrow \begin{matrix} n \rightarrow 0^+ \rightarrow \frac{0^+}{0^+} \rightarrow [n^r] = 0 \rightarrow \text{ج} \\ n \rightarrow 0^- \rightarrow \frac{0^-}{0^+} \rightarrow [n^r] = 0 \rightarrow \text{ج} \end{matrix}$

2

2) الف) $\lim_{n \rightarrow r^-} f[n] - r \Rightarrow 1 - r = 0 \rightarrow \boxed{0}$ / ب) $\lim_{n \rightarrow r^+} f[n] - r \Rightarrow 1 - r = 0 \rightarrow \boxed{0}$

ج) $\rightarrow f(r) - r \Rightarrow 1 - r = 0 \rightarrow [1 - r] = 0 \rightarrow \boxed{0}$ / د) $\rightarrow f(r) - r = 1 - r \rightarrow [1 - r] = 0 \rightarrow \boxed{0}$

3) الف) $\lim_{n \rightarrow \omega} \frac{r[n] + 1}{r} \Rightarrow \frac{r(r) + 1}{r} = \frac{r}{r} = \boxed{1}$

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ب) $\lim_{n \rightarrow \omega} \left[\frac{r[n] + 1}{r} \right] \Rightarrow \frac{r(r) + 1}{r} = 1 \rightarrow \boxed{1}$ / ج) $\lim_{n \rightarrow \omega} \left[\frac{r[n] + 1}{r} \right] \Rightarrow \frac{r(r) + 1}{r} = 1 \rightarrow \boxed{1}$

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ج) $\left[\lim_{n \rightarrow \omega^-} \frac{r_{n+1}}{r} \right] \rightarrow \left[\lim_{n \rightarrow \omega^-} \frac{1}{r} \right] = \boxed{\frac{1}{r}}$

د) $\left[\lim_{n \rightarrow \omega^+} \frac{r_{n+1}}{r} \right] \rightarrow \left[\lim_{n \rightarrow \omega^+} \frac{1}{r} \right] = \boxed{\frac{1}{r}}$

4) الف) $\lim_{n \rightarrow 1} \frac{n}{(n-1)^2} \rightarrow \lim_{n \rightarrow 1} \frac{1}{n-1} \rightarrow \begin{matrix} n \rightarrow 1^+ \rightarrow \frac{1}{0^+} = +\infty \\ n \rightarrow 1^- \rightarrow \frac{1}{0^-} = -\infty \end{matrix}$

ب) $\lim_{n \rightarrow 1} \frac{n-1}{(n-1)^2} \rightarrow \lim_{n \rightarrow 1} \frac{1}{n-1} \rightarrow \begin{matrix} n \rightarrow 1^+ \rightarrow \frac{1}{0^+} = +\infty \\ n \rightarrow 1^- \rightarrow \frac{1}{0^-} = -\infty \end{matrix}$



9) الف) $\lim_{n \rightarrow \infty} \frac{(-1)^{[n]}}{n^r(n-1)} \Rightarrow \text{Unit Circle} \rightarrow x_n \rightarrow \infty \rightarrow [x_n] = \infty \Rightarrow (-1)^\infty = 1$

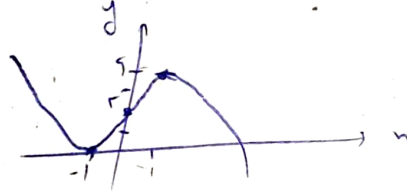
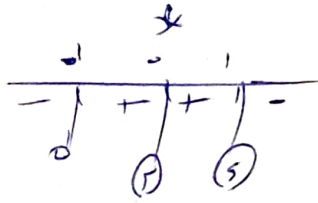
$\frac{1}{n^r(n-1)} \rightarrow \frac{1}{\infty} = 0$

2

ب) $\lim_{n \rightarrow r} \frac{n^r - [n^r]}{n - [n]} \xrightarrow{r+} \frac{n^r - r}{n - r} \rightarrow \frac{0}{0} \rightarrow \frac{n+r}{n-r} \rightarrow \frac{r+r}{r-r} = \infty$
 $\xrightarrow{r-} \frac{n^r - r}{n - r} \rightarrow \frac{r-r}{r-1} = 0$

10)

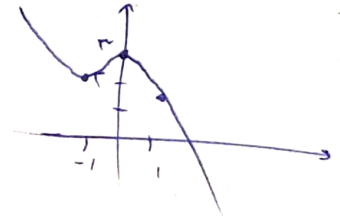
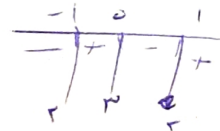
الف) $y = an^3 - 3n^2 + r \rightarrow -3n^2 + 4n^3 + r \rightarrow L(n) = -12n^2 + 12n^3 \Rightarrow 12n^2(-n+1)$
 $(12n^2)(1-n)(1+n)$



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ب) $y = n^3 - 3n^2 + r \rightarrow y' = 3n^2 - 6n \rightarrow 3n(n-1)(n+1)$

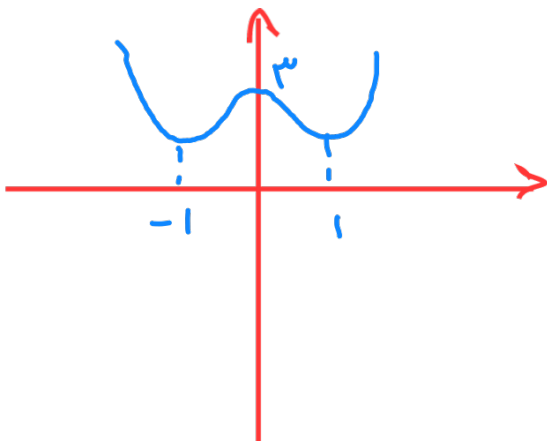


$y = n^3 - 3n^2 + r \rightarrow y' = 3n^2 - 6n$

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$y' = 0 \rightarrow 3n(n-1) = 0 \rightarrow n = 0, 1, -1$

n	-1	0	1
y'	-	+	-
y	↘	↑	↘



$$\text{ب) } n < -\frac{1}{4} \rightarrow n^2 > \frac{1}{14} \rightarrow -n^2 < -\frac{1}{14} \rightarrow -\frac{1}{n^2} > -14$$

$$\lim_{n \rightarrow \frac{1}{4}} \left[-\frac{1}{n^2} \right] = -16$$

۵-ب

$$n - 2\sqrt{n} \geq 0 \rightarrow \sqrt{n}(\sqrt{n} - 2) \geq 0 \quad \text{مع } n \leq 0$$

$$\rightarrow n \geq 2$$

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

II

سوال ۸-ب

$$\text{I} \cap \text{II} \quad n=0 \leq n \geq 2 \rightarrow \text{تبراطاف ضعیف نیست}$$

$$\lim_{n \rightarrow 0} \sqrt{n - 2\sqrt{n}} = \times$$

نسبت