

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

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د) $\lim_{n \rightarrow \infty} \frac{2n+5}{[n^2]}$
 $\xrightarrow[n \rightarrow \infty]{\frac{\infty}{\infty}} \frac{2n+5}{n^2} = \frac{\infty}{\infty} = 0$ ✓
 $\xrightarrow[n \rightarrow \infty]{\frac{\infty}{\infty}} \frac{2}{2n} = \frac{2}{\infty} = 0$ ✓

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چون مقدار ندارد

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الف) $\lim_{n \rightarrow \infty} f[n] - 2 \rightarrow [n] = 2$
 $f \times 2 - 2 = 4$ ✓

ب) $\lim_{n \rightarrow \infty} [2n-2] = [f(n)-2]$
 $= [10-2] = 8$ ✓

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

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د) $\left[\lim_{n \rightarrow \infty} 2n-2 \right] = [10] = 10$ ✓

الف) $\lim_{n \rightarrow \infty} \frac{2[n]+1}{2} = \frac{2[2]+1}{2} = \frac{2 \times 2 + 1}{2} = \frac{5}{2}$ ✓

ب) $\lim_{n \rightarrow \infty} \left[\frac{2n+1}{2} \right] = \left[\frac{2 \times 2 + 1}{2} \right] = [5] = 5$ ✓

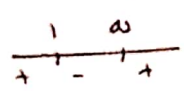
ج) $\left[\lim_{n \rightarrow \infty} \frac{2n+1}{2} \right] = [5] = 5$ ✓

د) $\left[\lim_{n \rightarrow \infty} \frac{2n+1}{2} \right] = [5] = 5$ ✓
 مطابق مسأله است

$\lim_{n \rightarrow \infty} \frac{2(2)+1}{2} = 5$

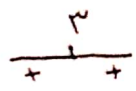
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الف) $\lim_{n \rightarrow \infty} \frac{n-5}{n^2-4n+5} = \frac{n-5}{(n-1)(n-5)}$
 $\xrightarrow[n \rightarrow \infty]{\frac{0}{0}} \frac{1-5}{0-} = +\infty$ ✓
 $\xrightarrow[n \rightarrow \infty]{\frac{0}{0}} \frac{1-5}{0+} = -\infty$ ✓
 چرنداد



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ب) $\lim_{n \rightarrow \infty} \frac{n-5}{n^2-4n+5} = \frac{n-5}{(n-1)(n-5)}$
 $\xrightarrow[n \rightarrow \infty]{\frac{0}{0}} \frac{1-5}{0+} = \frac{-4}{0+} = -\infty$ ✓
 $\xrightarrow[n \rightarrow \infty]{\frac{0}{0}} \frac{1-5}{0+} = \frac{-4}{0+} = -\infty$ ✓
 چرنداد



$$الف) \lim_{x \rightarrow 2^+} [-3x] - [0x] =$$

$$\begin{aligned} & \xrightarrow{x \rightarrow 2^+} \begin{aligned} & x > -\frac{1}{3} \\ & -3x < 9 \end{aligned} \\ & \xrightarrow{x \rightarrow 2^-} \begin{aligned} & x < -\frac{1}{3} \\ & -3x > 9 \end{aligned} \\ & [-3x] = 9 \end{aligned}$$

$$\begin{aligned} [-3x] &= 11 \quad \lim_{x \rightarrow 2^+} [-3x] - [0x] \\ &= 11 - (-10) = 21 \end{aligned}$$

$$ب) \lim_{x \rightarrow -\frac{1}{3}^-} \left[\frac{-1}{x^3} \right]$$

$$x \rightarrow -\frac{1}{3}^-$$

$$x < -\frac{1}{3}$$

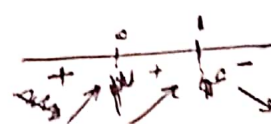
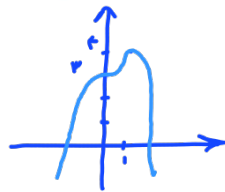
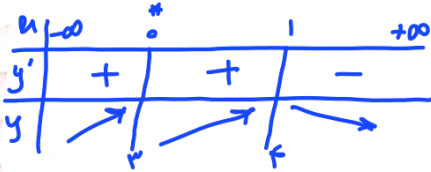
$$\frac{1}{x} > -3 \rightarrow \frac{1}{x^3} < -27$$

$$\frac{-1}{x^3} > -18$$

$$\lim_{x \rightarrow (-\frac{1}{3})^-} \left[\frac{-1}{x^3} \right] = [-18^+] = -18$$

$$ج) \lim_{x \rightarrow 1} [x^3 - x^2 + x]$$

$$\text{منقح} \rightarrow f'(x) = -12x^2 + 12x^2 - 12x(x-1)$$



$$x=1 \rightarrow f(1) - f(1) + 1 = 1$$

$$[f^-] = 1$$

$$د) \lim_{x \rightarrow 0} [x^3 - x^2 + x]$$

$$x \rightarrow 0$$

منقح

$$x=0 \Rightarrow f(0) - f(0) + 1 = 1$$

$$[x^+] = 1$$

$$\lim_{x \rightarrow 0} [x^3 - x^2 + x] = \begin{cases} \lim_{x \rightarrow 0^+} [x^+] = 1 \\ \lim_{x \rightarrow 0^-} [x^-] = 1 \end{cases}$$

$$\lim_{x \rightarrow 2} \frac{|x^3 - 1|}{x^3 - 8}$$

لوسه

$$\xrightarrow{x \rightarrow 2^+}$$

$$\frac{x^3 - 1}{x^3 - 8} = \frac{(x-1)(x^2 + x + 1)}{(x-2)(x^2 + 2x + 4)}$$

$$\text{Hop} \rightarrow \frac{x^2 + x + 1}{x^2 + 2x + 4} = \frac{10}{10} = 1$$

$$\xrightarrow{x \rightarrow 2^-}$$

$$\frac{-(x^3 - 1)}{x^3 - 8} = \frac{-(x-1)(x^2 + x + 1)}{(x-2)(x^2 + 2x + 4)} = \frac{-10}{10} = -1$$

منقح

$$هـ) \lim_{x \rightarrow \pi} \frac{|\sin x|}{\sin x}$$

$$\xrightarrow{x \rightarrow \pi^+}$$

$$\frac{-\sin x}{\sin x \cos x} = \frac{-1}{\cos x} = \frac{-1}{-1} = 1$$

منقح

$$\xrightarrow{x \rightarrow \pi^-}$$

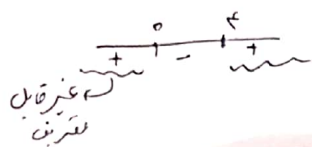
$$\frac{\sin x}{\sin x \cos x} = \frac{1}{\cos x} = \frac{1}{-1} = -1$$

الف) $\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x}$

$x \rightarrow \frac{\pi}{2}^+ \quad \cos x > 0$
 $\sqrt{0^+} = 0$ ✓
 $x \rightarrow \frac{\pi}{2}^- \quad \cos x < 0$
 $\sqrt{0^-} \rightarrow 0.5$ ✓
 حد ندارد

ب) $\sqrt{x - 2\sqrt{x}}$ $\Rightarrow$ $x \rightarrow 0^+$
 0^- $\Rightarrow$ تقریب شده
 حد ندارد

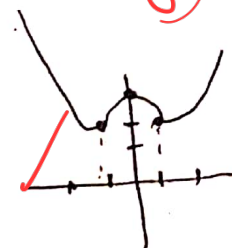
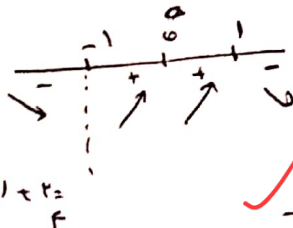
فرض کنیم $x > 0$
 $x - 2\sqrt{x} > 0$
 $\sqrt{x}(\sqrt{x} - 2) > 0$



الف) $\frac{(-1)^{[\sin x]}}{x^3 - x^2}$ $\Rightarrow$ $[\sin x] = [0^+] = 0$
 $\frac{1}{x^3 - x^2} = \frac{1}{x^2(x-1)} = \frac{1}{0^-} = -\infty$ ✓
 حد ندارد

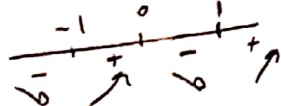
ب) $\frac{x^2 - [x^2]}{x - [x]}$ $\Rightarrow$ $x \rightarrow 2$
 $x > 2 \quad \frac{x^2 - 4}{x - 2} = \frac{(x-2)(x+2)}{(x-2)} = x+2 = 4$ ✓
 $x < 2 \quad \frac{x^2 - 4}{x - 2} = \frac{4 - x^2}{2 - x} = \frac{(2-x)(2+x)}{2-x} = 2+x = 4$ ✓
 حد ندارد

$y = 6x^3 - 4x^2 + x \rightarrow y' = -12x^2 + 12x = -12x^2 \frac{(x^2 + 1)}{(x-1)(x+1)}$



$x = 1 \rightarrow y = 6(1) - 4(1) + 1 = 3$
 $x = 0 \rightarrow y = 6(0) - 4(0) + 0 = 0$
 $x = -1 \rightarrow y = 6(-1) - 4(-1) + (-1) = -1$

ج) $y = x^3 - 2x^2 + x \rightarrow y' = 3x^2 - 4x = x(3x - 4)$



$x = 1 \rightarrow y = 1 - 2 + 1 = 0$
 $x = 0 \rightarrow y = 0 - 0 + 0 = 0$
 $x = -1 \rightarrow y = -1 - 2 - 1 = -4$