۲۵

۱-

الف) $\lim_{x \to 2^+} x^2 - 3 = 4 \times 2 - 3 = 5$

ب) $\lim_{x \to 2^-} x^2 - 3 = 4 \times 2 - 3 = 5$

۲-

الف) $\lim_{x \to 2^+} f(x) - 3 = f(2^+) - 3 = 4 \times 2 - 3 = 5$

ب) $\lim_{x \to 2^-} f(x) - 3 = f(2^-) = 4 \times 1 - 3 = 1$

۳-

الف) $\lim_{x \to 2^+} [x^2 - 3] = [4 \times 2^+ - 3] = [8^+ - 3] = [5^+] = 5$

ب) $\lim_{x \to 2^-} [x^2 - 3] = [4 \times 2^- - 3] = [8^- - 3] = [5^-] = 4$

۴-

الف) $\left[\lim_{x \to 2^+} x^2 - 3\right] = [5] = 5$

ب) $\left[\lim_{x \to 2^-} x^2 - 3\right] = [5] = 5$

۵-

الف) $\lim_{x \to 3} \frac{x^2 - 3}{x - 3}$ ، $3^+ \to \frac{9}{0^+} = +\infty$ ، $3^- \to \frac{9}{0^-} = -\infty$ ⟹ ندارد

ب) $\lim_{x \to 3} \frac{x^2 - 3}{(x-3)^2}$ ، $3^+ \to \frac{9}{0^+} = +\infty$ ، $3^- \to \frac{9}{0^+} = +\infty$ ⟹ ندارد

۶-

الف) $\lim_{x \to 3} \frac{x^2 - 3}{\sqrt{x-3}}$ ، $3^+ \to \frac{9}{0^+} = +\infty$ ، $3^- \to \frac{9}{\sqrt{0^-}} \times$ ⟹ ندارد

ب) $\lim_{x \to 3} \frac{x^2 - 3}{\sqrt{x^2 - 2x + 3}}$ ، $3^+ \to \frac{9}{\sqrt{0^+}} = +\infty$ ، $3^- \to \frac{9}{\sqrt{0^-}} \times$ ⟹ ندارد

	1	3
+	0 −	0 +

۷- الف) $\lim_{x\to 3} \frac{2x-3}{x^2-7x+12}$

$\begin{array}{c|ccc} x & 3^- & 3 & 3^+ \\ \hline x-3 & - & 0 & + \\ x-4 & - & - & - \\ \text{حاصل} & + & \frac{9}{0} & - \end{array}$

$3^+ : \frac{9}{0^+} = +\infty$

$3^- : \frac{9}{0^+} = -\infty$

ندارد

ب) $\lim_{x\to 3} \frac{2x-3}{(x-3)^2}$

$3^+ : \frac{9}{(0^+)^2} = \frac{9}{0^+} \times 0^+ = +\infty$

$3^- : \frac{9}{(0^-)^2} = \frac{9}{1} = 9$

ندارد

۸- الف) $\lim_{x\to 3} [2x] + [-2x]$

$3^+ : [6] + [-6] = 6 - 7 = -1$

$3^- : [5] + [-6] = 5 - 6 = -1$

ب) $\lim_{x\to -2} [-x^2] + [x]$

$-2^+ : \begin{cases} x > -2 & -x^2 < 4 \\ x > -2 & x > -4 \end{cases} \Rightarrow -1 - 2 = -3$

$-2^- : \begin{cases} x < -2 & -x^2 > 4 \\ x < -2 & x < -4 \end{cases} \Rightarrow -4 - 2 = -6$

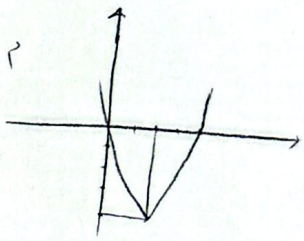
۹- الف) $\lim_{x\to 2} [x^2 - 2x] = -1$

حول اکسترمم $\to x \to 2$

$\min \begin{vmatrix} 2 \\ -1 \end{vmatrix}$

$2^+ : -(2^2 - 4) = 0$

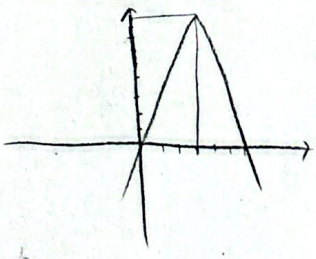
$2^- : -(2^2 - 4) = 0$



ب) $\lim_{x\to 3} [4x - x^2]$

حول اکسترمم

$\max \begin{vmatrix} 3 \\ 9 \end{vmatrix}$



$3^+ : [-9] = 8$

$3^- : [-9] = 8$

۱۰- الف) $\lim_{x\to 2} \frac{|x-2|}{x^2-3x+2} = \frac{0}{0}$ مبهم

$2^+ : \frac{x-2}{(x-2)(x-1)} = \frac{1}{1} = 1$

$2^- : \frac{-(x-2)}{(1-x)(x-2)} = -1$

ندارد

ب) $\lim_{x\to 1} \frac{x-[x]}{x^2-1} = \frac{0}{0}$ مبهم

$1^+ : \frac{x-1}{(x-1)(x+1)} = \frac{1}{2}$

$1^- : \frac{x}{x^2-1} = \frac{1}{0^-} = -\infty$

ندارد