

الف) $\lim_{x \rightarrow 2^+} \frac{f(x) - 3}{(f(x))^2 - 3} = \infty$

ب) $\lim_{x \rightarrow 2^-} (x - 3) = 1 - 3 = \infty$

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

ب) $\lim_{x \rightarrow 2^-} f[x] - 3 = f[2^-] - 3 = 1$

الف) $\lim_{x \rightarrow 2^+} [f(x) - 3] \rightarrow [1^+ - 3] = [\infty^+] = \infty$

ب) $\lim_{x \rightarrow 2^-} [f(x) - 3] = [1^- - 3] = [\infty^-] = f$

$\left[\lim_{x \rightarrow 2^+} f(x) - 3 \right] = \left[\lim_{x \rightarrow 2^+} 1 - 3 \right] = [\infty] = \infty$

ب) $\left[\lim_{x \rightarrow 2^-} f(x) - 3 \right] = \left[\lim_{x \rightarrow 2^-} 1 - 3 \right] = [\infty] = \infty$

الف) $\lim_{x \rightarrow 2} \frac{f(x) - 3}{\sqrt{x-2}} = \frac{0}{0}$
 $\begin{matrix} \nearrow 2^+ & \frac{0}{0^+} = \frac{0}{0^+} = +\infty \\ \searrow 2^- & \frac{0}{0^-} = -\infty \end{matrix}$

ب) $\lim_{x \rightarrow 2} \frac{f(x) - 3}{(x-2)^2} = \frac{0}{0}$
 $\begin{matrix} \nearrow 2^+ & \frac{0}{0^+} = +\infty \\ \searrow 2^- & \frac{0}{(0^-)^2} = \frac{0}{0^+} = +\infty \end{matrix}$

$$i) \lim_{x \rightarrow 3} \frac{f(x) - 3}{\sqrt{x} - 3} \begin{cases} x^+ \rightarrow \frac{9}{\sqrt{9} - 3} = \frac{9}{0^-} = +\infty \\ x^- \rightarrow \frac{9}{\sqrt{9} - 3} = \frac{9}{0^+} = -\infty \end{cases}$$

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$$b) \lim_{x \rightarrow 3} \frac{f(x) - 3}{\sqrt{x^2 - 9} + 3} = \frac{9}{\sqrt{0} + 3} \begin{cases} x^+ \rightarrow \frac{9}{\sqrt{0} + 3} = +\infty \\ x^- \rightarrow \frac{9}{\sqrt{0} + 3} = 0 \end{cases}$$

$$ii) \lim_{x \rightarrow 3} \frac{f(x) - 3}{x^2 - \sqrt{x+1}} = \frac{9}{0} \begin{cases} x^+ \rightarrow \frac{9}{0^+} = +\infty \\ x^- \rightarrow \frac{9}{0^-} = -\infty \end{cases}$$

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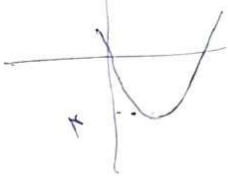
$$b) \lim_{x \rightarrow 3} \frac{f(x) - 3}{x - 3} \begin{cases} x^+ \rightarrow \frac{9}{0^+} = \frac{9}{0} \\ x^- \rightarrow \frac{9}{0^-} = -\frac{9}{1} = -9 \end{cases}$$

$$i) \lim_{x \rightarrow 3} [f(x)] + [g(x)] \begin{cases} x^+ \rightarrow [9^+] + [-4^+] = 9 - 4 = 5 \\ x^- \rightarrow [9^-] + [-4^-] = 9 - 4 = 5 \end{cases}$$

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$$b) \lim_{x \rightarrow -4} [-f(x)] + [g(x)] \begin{cases} x^+ \rightarrow [-f(x-4^+)] + [g(x-4^+)] = 2 \cdot 0 - 12 = -12 \\ x^- \rightarrow [-f(x-4^-)] + [g(x-4^-)] = 2 \cdot 4 - 12 = 8 \end{cases}$$

$$ii) \lim_{x \rightarrow 2} [x^2 - f(x)] \begin{cases} x^+ \rightarrow [4^+] - f^+ \\ x^- \rightarrow [4^-] - f^- \end{cases}$$



$$c) \lim_{x \rightarrow 4} [4x - x^2] = \lim_{x \rightarrow 4} [4x - x^2] = 4$$

$x = -\frac{b}{a} = 2$

$x < 0$

$x > 0$

$y < 0$

$y > 0$

$x = 4$

$y = 9$

$\lim_{x \rightarrow 4^+} = 9$

$\lim_{x \rightarrow 4^-} = 9$

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$$ii) \lim_{x \rightarrow 2} \frac{|x-2|}{x^2 - \sqrt{x+1}} \begin{cases} x^+ \rightarrow \frac{x-2}{(x-2)(x-1)} = \frac{1}{x-1} = \frac{1}{1} = 1 \\ x^- \rightarrow \frac{-(x-2)}{(x-2)(x-1)} = -1 \end{cases}$$

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$$i) \lim_{x \rightarrow 1} \frac{x - [x]}{x^2 - 1} \begin{cases} 1^+ \rightarrow \frac{1}{0^+} = +\infty \\ 1^- \rightarrow \frac{1}{0^-} = -\infty \end{cases}$$