

الف) $\lim_{x \rightarrow 2^+} \frac{2x+1}{x+1} = \frac{2(2)+1}{2+1} = \frac{5}{3} = \boxed{\frac{5}{3}}$

ب) $\lim_{x \rightarrow 2^-} \frac{2x+1}{x+1} = \frac{2(2)+1}{2+1} = \frac{5}{3} = \boxed{\frac{5}{3}}$

ج) $\lim_{x \rightarrow 2} \frac{2x+1}{x+1} = \frac{2(2)+1}{2+1} = \frac{5}{3} = \boxed{\frac{5}{3}}$

د) $\lim_{x \rightarrow 0} \frac{2x+1}{x^2} \rightarrow \frac{1}{0} = \frac{1}{0^+} = +\infty$
 $\frac{1}{0^-} = -\infty$ $\rightarrow$ حد ندارد!

الف) $\lim_{x \rightarrow 3^-} 4[x] - 2 = 4[3^-] - 2 = 4 \cdot 2 - 2 = \boxed{6}$

ب) $\lim_{x \rightarrow 3^-} [5x-2] = [15-2] = [13] = \boxed{13}$

ج) $\lim_{x \rightarrow 3^-} [4x-2] = [10] = \boxed{10}$

د) $\lim_{x \rightarrow 3^+} [4x-2] = [10] = \boxed{10}$

$\lim_{x \rightarrow 3^-} 4x-2 = 4(3)-2=10$

$\lim_{x \rightarrow 3^+} 4x-2 = 12-2=10$

الف) $\lim_{x \rightarrow 3^-} \frac{2[x]+1}{2} = \frac{2[3^-]+1}{2} = \frac{2 \cdot 2 + 1}{2} = \frac{5}{2} = \boxed{\frac{5}{2}}$

ب) $\lim_{x \rightarrow 3^-} \left[\frac{2x+1}{2} \right] = \left[\frac{2 \cdot 3 + 1}{2} \right] = \left[\frac{7}{2} \right] = \boxed{3}$

ج) $\lim_{x \rightarrow 3^-} \frac{2x+1}{2} = \frac{5}{2} = \boxed{\frac{5}{2}}$

د) $\lim_{x \rightarrow 3^+} \frac{2x+1}{2} = \frac{5}{2} = \boxed{\frac{5}{2}}$

$\lim_{x \rightarrow 3^-} \frac{2x+1}{2} = \frac{2(3)+1}{2} = \frac{5}{2}$

$\lim_{x \rightarrow 3^+} \frac{2x+1}{2} = \frac{2(3)+1}{2} = \frac{5}{2}$

الف) $\lim_{x \rightarrow 1} \frac{x-\Delta}{x^2-4x+\Delta} = \frac{1-\Delta}{1-4+\Delta} = \frac{-\Delta}{\Delta} = \boxed{-1}$

ب) $\lim_{x \rightarrow 2} \frac{x-2}{x^2-4x+9} = \frac{2-2}{(2-2)^2} = \frac{0}{0} = \boxed{\frac{-1}{0}}$

$\hookrightarrow x^2-4x+\Delta = (x-1)(x-\Delta) \Rightarrow \frac{1}{x-1} - \frac{\Delta}{x-\Delta}$

$\hookrightarrow (x-2)^2 \rightarrow \frac{1}{x-2} - \frac{2}{x-2}$

$\xrightarrow{1^+} \frac{1-\Delta}{0^-} = \frac{-\Delta}{0^-} = +\infty$
 $\xrightarrow{1^-} \frac{1-\Delta}{0^+} = \frac{-\Delta}{0^+} = -\infty$ $\rightarrow$ حد ندارد.

$\xrightarrow{2^+} \frac{2-2}{0^+} = \frac{0}{0^+} = \infty$
 $\xrightarrow{2^-} \frac{2-2}{0^-} = \frac{0}{0^-} = -\infty$ $\rightarrow$ حد ندارد.

الف) $\lim_{x \rightarrow -2} [-3x] - [4x]$

ب) $\lim_{x \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{x^2} \right]$

$\xrightarrow{-2^+} [-3(-2^+)] - [4(-2^+)] = [6^-] - [-8^+] = 6 - (-8) = 14$

$x < -\frac{1}{2} \Rightarrow \frac{1}{x} > -2 \Rightarrow \frac{1}{x^2} < 4$

$\xrightarrow{-2^-} [-3(-2^-)] - [4(-2^-)] = [6^+] - [-8^-] = 6 - (-8) = 14$

$\frac{-1}{x^2} > -4 \Rightarrow \lim_{x \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{x^2} \right] = [-4^+] = \boxed{-4}$

ا) $\lim_{x \rightarrow 1} [x^2 - 2x^2 + 2]$ $\Rightarrow x \rightarrow 1 \Rightarrow x^2 - 2x^2 + 2 = -x^2 + 2x^2 + 2$ $-1x^2 + 2x^2 = -1x(x-1)$ $\rightarrow \infty$ $x=1 \Rightarrow 1^2 - 2(1)^2 + 2 = 1$ $\Rightarrow [x^2] = 1$	ب) $\lim_{x \rightarrow 0} [x^2 - 2x^2 + 2]$ $\Rightarrow x \rightarrow 0 \Rightarrow x^2 - 2x^2 + 2 = -x^2 + 2x^2 + 2$ $-1x^2 + 2x^2 = -1x(x-1)$ $x=0 \Rightarrow 0^2 - 2(0)^2 + 2 = 2$ $\Rightarrow [x^2] = 2$
ا) $\lim_{x \rightarrow 2} \frac{ x^2 - 1 }{x^2 - 1} = \frac{ 1 - 1 }{1 - 1} = \frac{0}{0}$ $\rightarrow x > 2 \Rightarrow \frac{x^2 - 1}{x^2 - 1} = \frac{(x-1)(x+1)}{(x-1)(x+1)} = \frac{x+1}{x+1}$ $x=2 \Rightarrow \frac{2+1}{2+1} = 1$ $\rightarrow x < 2 \Rightarrow \frac{-(x^2 - 1)}{x^2 - 1} = \frac{-(x-1)(x+1)}{(x-1)(x+1)} = \frac{-(x+1)}{x+1}$ $x=2 \Rightarrow \frac{-(2+1)}{2+1} = -1$	ب) $\lim_{x \rightarrow \pi} \frac{ \sin x }{\sin x} = \frac{0}{0}$ $\rightarrow x < \pi \Rightarrow \sin x < 0 \Rightarrow \frac{\sin x}{\sin x \cos x} = \frac{1}{\cos x} = \frac{1}{-1} = -1$ $\rightarrow x > \pi \Rightarrow \sin x > 0 \Rightarrow \frac{\sin x}{\sin x \cos x} = \frac{1}{\cos x} = \frac{1}{1} = 1$
ا) $\lim_{x \rightarrow \frac{\pi}{2}} \sqrt{\cos x} = \sqrt{0}$ $\rightarrow x < \frac{\pi}{2} \Rightarrow \cos x > 0 \Rightarrow \sqrt{0^+} = 0$ $\rightarrow x > \frac{\pi}{2} \Rightarrow \cos x < 0 \Rightarrow \sqrt{0^-} = 0$	ب) $\lim_{x \rightarrow 0} \sqrt{x - x\sqrt{x}} = \sqrt{0 - 0} = 0$ $\rightarrow x > 0 \Rightarrow \sqrt{x - x\sqrt{x}} = \sqrt{x(1 - \sqrt{x})} = \sqrt{x} \sqrt{1 - \sqrt{x}} \geq 0$ $\rightarrow x < 0 \Rightarrow \sqrt{x - x\sqrt{x}} = \sqrt{x(1 - \sqrt{x})} = \sqrt{x} \sqrt{1 - \sqrt{x}} \geq 0$
ا) $\lim_{x \rightarrow 0^+} \frac{(-1)^{\sin x}}{x^2 - x^2}$ $x \rightarrow 0 \Rightarrow \sin x \rightarrow 0 \Rightarrow (-1)^0 = 1$ $x^2 - x^2 = x^2(x-1)$ $\frac{1}{x^2(x-1)} = \frac{1}{x^2} \cdot \frac{1}{x-1} \rightarrow \infty$	ب) $\lim_{x \rightarrow 2} \frac{x^2 - [x^2]}{x - [x]}$ $\rightarrow x < 2 \Rightarrow \frac{x^2 - [x^2]}{x - [x]} = \frac{x^2 - x^2}{x - x} = \frac{0}{0} \Rightarrow \frac{(x-1)(x+1)}{x-1} = x+1$ $\rightarrow x > 2 \Rightarrow \frac{x^2 - [x^2]}{x - [x]} = \frac{x^2 - x^2}{x - x} = \frac{0}{0} = 0$
ا) $y = 2x^2 - 2x^2 + 2$ $y = -2x^2 + 2x^2 + 2$ $y' = -4x + 4x = -4x(x-1)(x+1)$ $x=1 \Rightarrow y = -2(1)^2 + 2(1)^2 + 2 = 2$ $x=0 \Rightarrow y = 0 + 0 + 2 = 2$ $x=-1 \Rightarrow y = -2(-1)^2 + 2(-1)^2 + 2 = 0$	ب) $y = x^2 - 2x^2 + 2$ $y' = 2x - 4x = -2x(x-1)(x+1)$ $x=1 \Rightarrow y = 1 - 2(1)^2 + 2 = 1$ $x=0 \Rightarrow y = 0 - 2(0)^2 + 2 = 2$ $x=-1 \Rightarrow y = 1 - 2(1)^2 + 2 = 1$