

سوال ۱)

$$الف) \lim_{x \rightarrow 2^+} \frac{2x+5}{x+1} = \frac{2(2)+5}{2+1} = \frac{9}{3} = 3$$

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

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

$$د) \lim_{x \rightarrow 0} \frac{2x+7}{[x]} = \frac{7}{0} \text{ بی حد}$$

سوال ۲)

$$الف) \lim_{x \rightarrow 1^-} f(x) - 2 = f(1^-) - 2 = f(1) - 2 = 4$$

$$ب) \lim_{x \rightarrow 1^+} [f(x)-2] : x < 1^+ \rightarrow f(x) < 1^+ \rightarrow f(x)-2 < 1^+ \rightarrow \lim [f(x)-2] = 9$$

$$ج) \left[ \lim_{x \rightarrow 1^-} f(x)-2 \right] : 1^- = 1,9 \rightarrow \left[ \lim_{x \rightarrow 1^-} f(x)-2 \right] = [9,9] = 9$$

$$د) \left[ \lim_{x \rightarrow 1^+} f(x)-2 \right] : 1^+ = 1,1 \rightarrow f(x)-2 = 10,1 \rightarrow \left[ \lim_{x \rightarrow 1^+} f(x)-2 \right] = 10$$

سوال ۳)

$$الف) \lim_{x \rightarrow 2^-} \frac{3[x]+1}{x} \xrightarrow{[2^-]=2} \lim_{x \rightarrow 2^-} \frac{3(2)+1}{x} = \frac{7}{2} = 3,5$$

$$ب) \lim_{x \rightarrow 2^-} \left[ \frac{3x+1}{x} \right] \rightarrow x < 2^- \rightarrow 3x < 6^- \rightarrow 3x+1 < 7^- \rightarrow \frac{3x+1}{x} < 7^- \rightarrow [7^-] = 6$$

$$ج) \left[ \lim_{x \rightarrow 2^-} \frac{3x+1}{x} \right] \rightarrow x < 2^- \rightarrow 3x < 6^- \rightarrow 3x+1 < 7^- \rightarrow \frac{3x+1}{x} < 7^- \rightarrow \lim_{x \rightarrow 2^-} \frac{3x+1}{x} = 7^- \rightarrow [7^-] = 6$$

$$د) \left[ \lim_{x \rightarrow 2^+} \frac{3x+1}{x} \right] : x > 2^+ \rightarrow 3x > 6^+ \rightarrow 3x+1 > 7^+ \rightarrow \frac{3x+1}{x} > 7^+ \rightarrow \lim_{x \rightarrow 2^+} \frac{3x+1}{x} = 7^+ \rightarrow [7^+] = 7$$

الف)  $\lim_{x \rightarrow 1} \frac{x-5}{x^2-4x+5} \cdot \lim_{x \rightarrow 1} \frac{x-5}{(x-5)(x-1)}$

$x \rightarrow 1^+ \rightarrow \frac{1}{0^+} = +\infty$   
 $x \rightarrow 1^- \rightarrow \frac{1}{0^-} = -\infty$

سوال (4)

ب)  $\lim_{x \rightarrow 3} \frac{x-4}{x^2-4x+9} = \lim_{x \rightarrow 3} \frac{x-4}{(x-3)^2}$

$x \rightarrow 3^+ \rightarrow \frac{-1}{0^+} = -\infty$   
 $x \rightarrow 3^- \rightarrow \frac{-1}{0^-} = -\infty$

سوال (5)

الف)  $\lim_{x \rightarrow -1^0} [-1^x] - [5x]$

$\rightarrow (-1)^+ \xrightarrow{x > -1^0, \delta x > -1.0} 1 - (-1.5) = [2.5]$   
 $\rightarrow (-1)^- \xrightarrow{x < -1^0, \delta x < -1.0} 9 - (-1.4) = [2.6]$

سوال (5)

سوال (6)

الف)  $\lim_{x \rightarrow 2} \frac{|x^3-1|}{x^2-4}$

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

سوال (7)

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

$x \rightarrow \pi^+ \rightarrow \frac{-\sin x}{\sin x \cos x} = \frac{-1}{-1} = 1$   
 $x \rightarrow \pi^- \rightarrow \frac{\sin x}{\sin x \cos x} = \frac{1}{-1} = -1$

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

$\frac{0^+}{0^+} \rightarrow \sqrt{0} = 0$   
 $\frac{0^-}{0^-} \rightarrow \sqrt{0} = 0$

سوال (8)

ب)  $\lim_{x \rightarrow 0} \sqrt{x-2\sqrt{x}}$

$\frac{0^+}{0^+} \rightarrow \sqrt{0-2(0)} = \sqrt{0} = 0$   
 $\frac{0^-}{0^-} \rightarrow \sqrt{0} = 0$