

الف) $\lim_{u \rightarrow 1} \frac{u-0}{u^2-4u+0} = \frac{u < 0}{(u-0)(u-1)} = \frac{1}{u-0}$ ②

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

ب) $\lim_{u \rightarrow 2} \frac{u-2}{(u-2)^2}$ ③

دو طرفه نزديگي $\rightarrow$ $\frac{-1}{0^+} \rightarrow -\infty$

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

$\frac{9}{9} - (-10) = 22$

ب) $\lim_{u \rightarrow (-\frac{1}{2})^-} \left[\frac{-1}{u^2} \right]$ ⑤

$u < -\frac{1}{2}$ $u^2 > \frac{1}{4}$ $\frac{1}{u^2} < -\frac{1}{14}$ $\frac{-1}{u^2} > -14$

$\left[\frac{-1}{u^2} \right] = -14$

الف) $\lim_{u \rightarrow 1} [2u^2 - 3u^2 + 3]$ ⑥

$12u^2 - 12u^2 = 0$

$12u^2(1-u)$

$1^+ \rightarrow 0^+ [2^+] = 2$

$1^- \rightarrow 0^- [2^-] = 2$

ب) $\lim_{u \rightarrow 0} [2u^2 - 3u^2 + 3]$ ⑦

$12u^2 - 12u^2 = 0$

$12u(1-u)$

$u \rightarrow 0^+ \rightarrow 0^+ [2^+] = 2$

$u \rightarrow 0^- \rightarrow 0^- [2^-] = 2$

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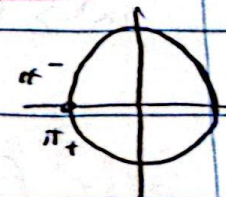
$$(iii) \lim_{u \rightarrow r} \frac{|u^r - 1|}{u^r - 1} \quad \textcircled{1} r^+ \xrightarrow{\text{L'Hôpital}} \frac{(u-r)(u^r + \epsilon + ru)}{(u-r)(u+r)} \quad \textcircled{V}$$

$$\frac{1r}{r} = r \quad \textcircled{r} r^- \xrightarrow{\text{L'Hôpital}} \frac{(r-u)(u^r + 2 + ru)}{(u-r)(u+r)} = -r \quad \checkmark$$

$$(iv) \lim_{u \rightarrow \pi} \frac{|\sin u|}{\sin u} \quad \textcircled{1} \pi^+ \xrightarrow{\text{L'Hôpital}} \frac{-\sin u}{r \sin u \cos u} \quad \textcircled{1} r \quad \checkmark$$

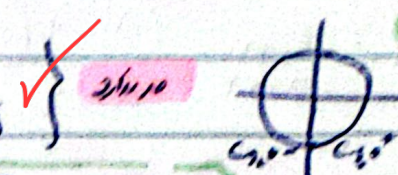
$$\textcircled{r} \pi^- \xrightarrow{\text{L'Hôpital}} \frac{\sin u}{r \sin u \cos u} = \frac{-1}{r} \quad \checkmark$$

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$$\lim_{u \rightarrow \frac{\pi}{2}} \sqrt{\cos u}$$

$$\left[\begin{array}{c} \frac{0^+}{\frac{\pi}{2}^+} \\ \frac{0^-}{\frac{\pi}{2}^-} \end{array} \right] \sqrt{0^+} \rightarrow 0$$



$$\lim_{u \rightarrow 0} \sqrt{u - 2\sqrt{u}}$$

$$\left[\begin{array}{c} 0^+ \\ 0^- \end{array} \right] \sqrt{0^+ - 2\sqrt{0^+}} \rightarrow 0$$

در هر دو طرف
در بازه‌های مختلف
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$$u - 2\sqrt{u} \geq 0 \Rightarrow u^2 \geq 4u$$

$$u^2 \geq \epsilon u \Rightarrow u^2 - \epsilon u \geq 0 \Rightarrow u(u - \epsilon) \geq 0$$

$$\frac{0^+}{\frac{\epsilon}{4}} \rightarrow \frac{0^+}{\frac{\epsilon}{4}} = 0$$

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$$\lim_{u \rightarrow 0^+} \frac{-1(\sin u)}{u^2 - u} = \frac{(-1)^0}{0^+ - 0^+} = \frac{1}{0^+} = +\infty$$

$$\frac{1}{0^+} = +\infty$$

$$\frac{1}{u^2(1-u)} \rightarrow \frac{1}{0^+} = +\infty$$

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در بازه‌های مختلف

$$\lim_{u \rightarrow 2} \frac{u^2 - [u^2]}{u - [u]}$$

$$\textcircled{1} u \rightarrow 2^+ \quad \frac{u^2 - \epsilon}{u - 2} = u + 2$$

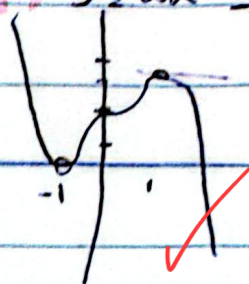
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$$\frac{u^2 - 2}{u - 1} = \frac{2^2 - 2}{1} = 2$$

در بازه‌های مختلف

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$$y = 5u^3 - 2u^2 + 2$$

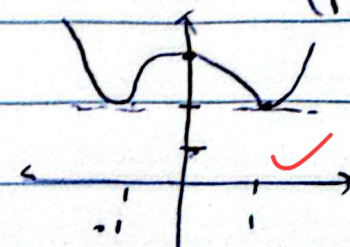


مشتق

$$y' = 15u^2 - 4u$$

$$15u^2(1-u^2) = (1-u)(1+u)$$

$$\frac{1}{0^+} = +\infty$$



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$$y = u^3 - 2u^2 + 2$$

$$y' = 3u^2 - 4u$$

$$\epsilon u(u-1)(u+1)$$

$$\frac{1}{0^+} = +\infty$$