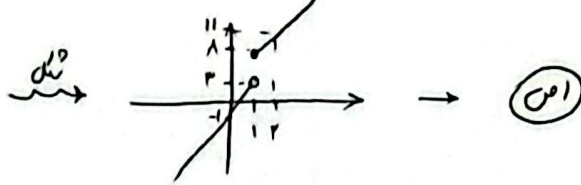


$$f(x+1) = \begin{cases} 2x+5 & x > 1 \\ 4x-1 & x < 1 \end{cases}$$



①

$$y = \sqrt{f(2-x) - f(x+1)} \rightarrow y > 0 \rightarrow f(2-x) > f(x+1) \xrightarrow{\text{حرف اولی را در دو طرف مرتب کنیم}} 2-x > x+1 \rightarrow 2 > 2x \rightarrow x < 1$$

حرف دوم تابع f است و در هر دو طرف داریم
 انتقالی را در هر دو طرف داریم

②

$$f(x) = (x^3 + x)^3 \rightarrow \text{همه تابع اولی} \rightarrow f \rightarrow (x^3)^3 \rightarrow \text{فرا فر برداری اولی و دومی کاشی می بردارد}$$

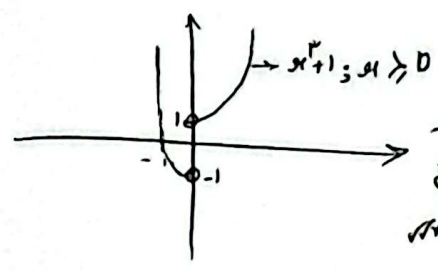
$$f(f(x)) < f(x^3) \rightarrow f(x) < x^3 \rightarrow (x^3 + x)^3 < x^3 \rightarrow x^3 + x < x$$

$$\sqrt{x} \in \mathbb{R} \rightarrow x \geq 0 \rightarrow x^2 < 0 \rightarrow x < 0$$

③

$$x > 0 \rightarrow x(x^2 + \frac{1}{x}) \xrightarrow{D.R. - \frac{1}{x}} x^3 + 1 \rightarrow$$

$$x < 0 \rightarrow -x(x^2 + \frac{1}{x}) \xrightarrow{D.R. - \frac{1}{x}} -x^3 - 1 \rightarrow$$



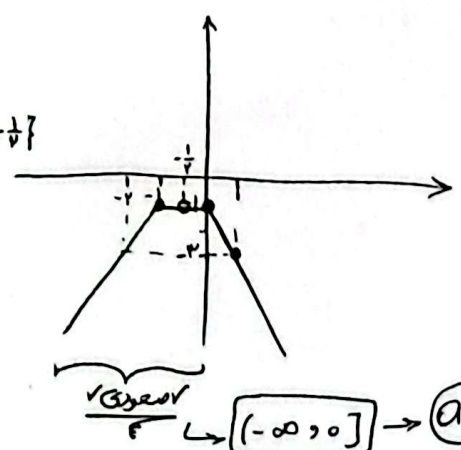
غیر کفنی است ✓
 که در هر دو طرف صعودی است
 است و در هر دو طرف نزولی است

④

$$x \geq 0 \rightarrow \frac{2x+1}{x-1} \rightarrow \frac{2x+1}{-1} \rightarrow -2x-1$$

$$-1 < x < 0 \rightarrow \frac{2x+1}{-x-1} \xrightarrow{D.R. [0, -1] - \{-\frac{1}{x}\}} -1$$

$$x < -1 \rightarrow \frac{2x+1}{-x+1} \rightarrow 2x+1$$

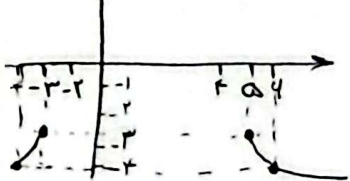


$$(-\infty, 0] \rightarrow a \geq 0$$

⑤

$$x^2 - 2x - 1 > 0 \rightarrow (x-4)(x+2) \rightarrow \begin{matrix} - & + & - & + \end{matrix}$$

$a > 0 \rightarrow \times$
 $a < 0 \rightarrow \checkmark$

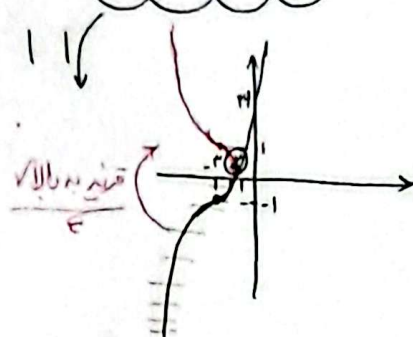


با حفظ داری $x=4, x=-2$
 از روی شکل $[-2, 4]$ است

حل مسألة تكاملية (4)

تابع $f \rightarrow a^x \rightarrow |a| > 0 \rightarrow 0 \rightarrow$
 $a > 1 \rightarrow$ $a^x \rightarrow$
 $(-\infty, -2) \cup (2, +\infty) \leftarrow \frac{-x^2}{x^2 - 4} \leftarrow a^{2-x} > 0 \leftarrow a^{2-3} > 1$
 $-\infty, 2 \cup (2, +\infty) \leftarrow \frac{-x^2}{x^2 - 4} \leftarrow a^{2-3} \geq 1$

(7) $(-2, -1) \leftarrow$ فقط عطف \checkmark
 $x^3 + 9x^2 + 27x + 27 \leftarrow f = (x+3)^3 - 1$



$\rightarrow (-2, +\infty) \rightarrow (k_2 - 2)$

(8)

$f \rightarrow x + \sqrt{x} - 2 \rightarrow$ (9) $f(f(x)) \leq f(\sqrt{x})$
 $\rightarrow f(x) \leq \sqrt{x} \rightarrow x - 2 \leq 0 \rightarrow x \leq 2$ I
 $x + \sqrt{x} - 2$

$\sqrt{x} \geq 0 \rightarrow$ اذ أكبر
 $f(x) \geq 0 \rightarrow x + \sqrt{x} - 2 \geq 0$ \rightarrow $x \geq 1$ II
 $0 < x < 1 \rightarrow$ $0 < 0$
 $x \geq 1 \rightarrow 0$
 استبدال $\rightarrow I \cap II \rightarrow 1 < x \leq 2$

(9) $f(x) = 2$
 $\sqrt{9 \cos^2 x - 1} - \sqrt{1 - 9 \cos^2 x}$
 $\frac{-1}{\sqrt{1-9 \cos^2 x}} - \frac{-1}{\sqrt{1-9 \cos^2 x}}$
 $\frac{1}{\sqrt{1-9 \cos^2 x}} - \frac{1}{\sqrt{1-9 \cos^2 x}}$
 $\rightarrow 2 - \frac{1}{\sqrt{1-9 \cos^2 x}} \rightarrow \frac{1}{\sqrt{1-9 \cos^2 x}} - 2 \rightarrow -\frac{3}{2}$

$\frac{1}{\sqrt{1-9 \cos^2 x}} - \frac{1}{\sqrt{1-9 \cos^2 x}} \rightarrow 2 - \frac{1}{\sqrt{1-9 \cos^2 x}} \rightarrow \frac{1}{\sqrt{1-9 \cos^2 x}} - 2 \rightarrow -\frac{3}{2}$
 $\frac{1}{\sqrt{1-9 \cos^2 x}} - \frac{1}{\sqrt{1-9 \cos^2 x}} \rightarrow 2 - \frac{1}{\sqrt{1-9 \cos^2 x}} \rightarrow \frac{1}{\sqrt{1-9 \cos^2 x}} - 2 \rightarrow -\frac{3}{2}$
 $R_f = [-\frac{3}{2}, \frac{15}{4}] \rightarrow \frac{15}{4} - (-\frac{3}{2}) \rightarrow \frac{21}{4} \rightarrow (5, 15)$

(10) $f(x) \rightarrow x - [x+2] \rightarrow x - [x] + 2 \rightarrow [2, 3] \rightarrow R_f$
 $g \rightarrow$ $\frac{2x^2 - 2}{x} \rightarrow \frac{15}{x}$
 $\frac{2x^2 - 2}{x} \rightarrow \frac{15}{x}$
 $\frac{2x^2 - 2}{x} \rightarrow \frac{15}{x}$