

$$f(x+r) = \begin{cases} rx+5 & x \geq 1 \\ 2x-1 & x < 1 \end{cases}$$

$$x+r = t$$

$$f(t) = \begin{cases} r(t-r)+5 = rt-1 & t \geq r \\ f(t-r)-1 = rt-9 & t < r \end{cases}$$

$$f(x) = \begin{cases} rx-1 & x \geq r \\ 2x-9 & x < r \end{cases}$$

$$f(r-x) \xrightarrow{x \geq r} f(r-x) = 1-rx$$

$$\xrightarrow{x < r} f(r-x) = r-rx$$

$$f(x+1) \xrightarrow{x \geq r} f(x+1) = rx+1 \xrightarrow{x \geq r} 1-rx - rx - 1 = -4x+4$$

$$\xrightarrow{x < r} f(x+1) = 2x-9 \xrightarrow{x < r} r-rx - 2x+9 = -1x+1$$

$$\sqrt{-4x+4} \rightarrow \frac{1}{\phi} \quad x \in (-\infty, 1] \quad \textcircled{I}$$

$$\sqrt{-1x+1} \rightarrow \frac{1}{\phi} \quad x \in (-\infty, 1] \quad \textcircled{II} \quad I \cap II = (-\infty, 1]$$

$$f(f(x)) = ((x^p+x)^q + (x^q+x)^p)^r \quad f(x^r) = (x^q+x^r)^r \quad \textcircled{III}$$

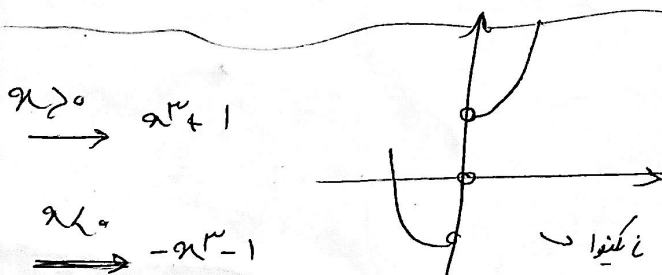
$$((x^p+x)^q + (x^q+x)^p)^r < (x^q+x^r)^r$$

$$(x^r+x)^q + (x^p+x)^p < x^q+x^r$$

$$x > 0 \quad x \text{ لا } \quad x=1 \quad 2r < r \quad \times$$

$$x=0 \quad \rightarrow \text{مطلوب} \quad x=0 \quad 0 < 0 \quad \times$$

$$x < 0 \quad \checkmark \text{ لا } \quad x=-1 \quad -2r < -r \quad \checkmark \Rightarrow x \in (-\infty, 0)$$



سؤال 2

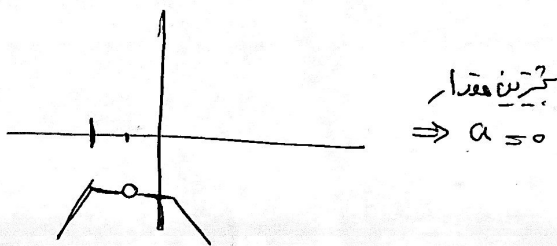
$$x \geq 0 \rightarrow \frac{rx+1}{-1} = -rx-1$$

$$-1 \leq x < 0 \rightarrow \frac{rx+1}{-rx+1} = -1$$

سؤال 3

$$x < -1 \rightarrow \frac{rx+1}{1} = rx+1$$

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



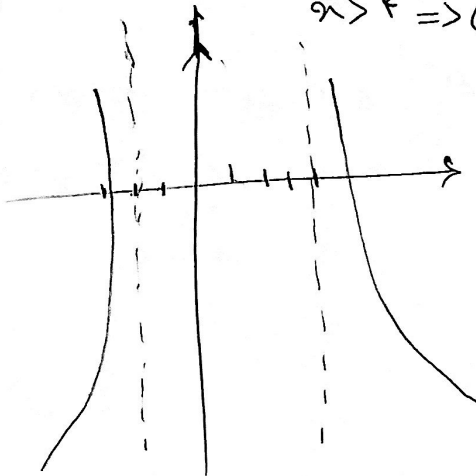
$$y = \log_{\frac{1}{2}} (x^2 - 2x - 1)$$

$$x^2 - 2x - 1 > 0 \rightarrow (x-4)(x+2) > 0$$

$$\begin{array}{c|cc} & -2 & 4 \\ \hline & + & - & + \\ \hline \end{array}$$

$$x < -2 \Rightarrow (-3, 7) \text{ و } (-4, 14)$$

$$x > 4 \Rightarrow (5, 7) \text{ و } (4, 14)$$



در بازه $(-\infty, 2)$ ابتدا صعودی

$$x^2 - 3 > 1$$

سوال (4) الف)

$$x^2 - 3 - 1 > 0$$

$$x^2 > 4$$

$$x > |2| \rightarrow x > 2 \text{ و } x < -2$$

ب) اگرچه اعدادی آید نباشد می توانیم ^{باید} به ناسته باشیم (همه صعودی هم نزولی)

$$x^2 - 3 \geq 1 \quad x^2 \geq 4 \quad x \geq 2 \text{ و } x \leq -2 \quad \textcircled{I}$$

$$x^2 - 3 = 0 \Rightarrow x^2 = 3 \rightarrow x = \pm \sqrt{3} \quad \textcircled{II}$$

$$\textcircled{I} \cap \textcircled{II} \rightarrow (-\infty, -2] \cup [2, +\infty) \cup \{\pm \sqrt{3}\}$$

$$y = x^3 \Rightarrow (x+3)^3 - 1$$

$$(0, 0)$$

$$(1, 3)$$

سوال (7)

$$|f(x)| = |(x+3)^3 - 1|$$

اکبر صعودی

$$(x+3)^3 - 1 = 0 \Rightarrow x+3 = 1 \Rightarrow x = -2$$

$$x = -2$$

سؤال ٨

سؤال ٨

$$f(f(x)) \leq f(\sqrt{x}) \rightarrow f(x) \leq \sqrt{x}$$

$$x + \sqrt{x} - x \leq \sqrt{x} \Rightarrow x \leq x \quad \text{I}$$

$$\sqrt{x} \rightarrow x \geq 0 \quad \text{II}$$

$$\text{II} \cap \text{I} \rightarrow [0, x] \rightarrow \{0, 1, x\}$$

مجموعة

سؤال ٩

$$-1 \leq \cos x \leq 1 \Rightarrow 0 \leq \cos^2 x \leq 1$$

$$0 \leq 9 \cos^2 x \leq 9 \Rightarrow -1 \leq 9 \cos^2 x - 1 \leq 8$$

$$-1 \leq \sqrt[3]{9 \cos^2 x - 1} \leq 2$$

$$-2 \leq \sqrt[3]{1 - 9 \cos^2 x} \leq 1$$

$$\rightarrow x^{-1} - x^1 = \frac{1}{x} - x = -\frac{x}{x}$$

$$x^2 - x^{-2} = x^2 - \frac{1}{x^2} = \frac{x^4 - 1}{x^2}$$

$$b - a = \frac{1}{x} + \frac{1}{x} = \frac{2}{x}$$

$$\Rightarrow [a, b] \rightarrow \left[-\frac{x}{x}, \frac{2}{x}\right]$$

$$x = n + r \text{ حيث } 0 \leq r < 1$$

سؤال ١٠

$$x + 1 = n + r + 1 \Rightarrow [x + 1] = n + 1$$

$$f(x) = n + r - (n + 1) = r - 1$$

$$f(x) \in [-1, 0)$$

$$f(x) = -1 \Rightarrow \frac{x^{-1} - x^1}{x} = -\frac{1}{x}$$

$$f(x) = -1 \Rightarrow \frac{x^{-1} - x^1}{x} = -\frac{x}{x}$$

$$g \circ f(x) \in \left[-\frac{1}{x}, -\frac{x}{x}\right]$$