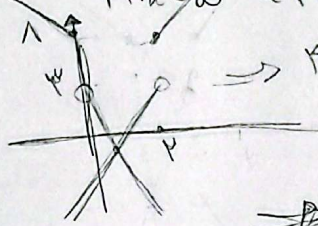


$$f(x+1) = \begin{cases} 2x+5 & x > 1 \\ x-1 & x < 1 \end{cases} \Rightarrow f(x+1) = \begin{cases} 2x+2 & x > 1 \\ x-5 & x < 1 \end{cases}, f(3-x) = \begin{cases} 2-x+1 & x < 2 \\ -x+3 & x > 2 \end{cases}$$

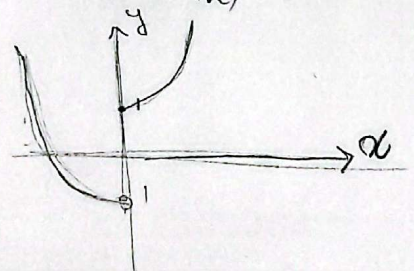
$$y = \sqrt{f(3-x) - f(x+1)} \Rightarrow f(x-5) = -f(x+2) \Rightarrow x=1 \Rightarrow \alpha=1$$

$$f(x+1) < f(3-x) \Rightarrow D_f = (-\infty, 1]$$


$$f(x) = (x^3 + x) \Rightarrow f \circ f(x) \Rightarrow f(x) \text{ صعودی} \Rightarrow f(x) < x^3$$

$$f \circ f(x) = f(f(x)) < f(x^3)$$

$$\Rightarrow x^3 + x < x \Rightarrow x^3 < 0 \Rightarrow x < 0 \Rightarrow D_f = (-\infty, 0)$$

$$y = |x| \left(x^3 + \frac{1}{x} \right) \Rightarrow |x| \left(\frac{x^3 + 1}{x} \right) \Rightarrow \begin{cases} x^3 + 1 & x > 0 \\ -x^3 - 1 & x \leq 0 \end{cases}$$


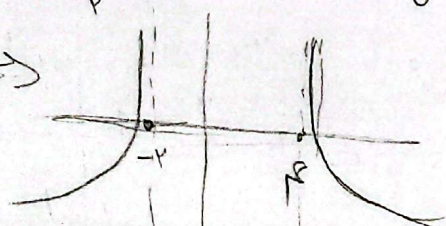
نویس

$$f(x) = \frac{2x+1}{|x|-|x+1|} \Rightarrow \begin{cases} x > 0 \Rightarrow \frac{2x+1}{x(x+1)} = -2x-1 \rightarrow \text{نزولی} \\ -1 < x < 0 \Rightarrow \frac{2x+1}{-x-x-1} = \frac{2x+1}{-2x-1} = -1 \rightarrow \text{معدولی} \\ x < -1 \Rightarrow \frac{2x+1}{-x+x+1} = 2x+1 \rightarrow \text{معدولی} \end{cases}$$

$$\Rightarrow \max x \Rightarrow -1 \rightarrow (-\infty, 0] \Rightarrow \alpha=0$$

$$y = \log_{\frac{1}{2}}(x^2 - 2x - 1) \Rightarrow y = -\log_2(x^2 - 2x - 1) \Rightarrow x^2 - 2x - 1 > 0$$

$$\Rightarrow (x-4)(x+2) > 0 \Rightarrow x > 4 \text{ یا } x < -2$$

$$\Rightarrow (-\infty, -2) \cup (4, \infty)$$


$f(x) = (a^x - 1)^n \Rightarrow$ مشتق اول $\Rightarrow a^x - 1 > 1 \Rightarrow a^x > 2 \Rightarrow a > 2^{1/x}$
 $a < 2$

$a^x - 1 > 1 \Rightarrow a^x > 2 \Rightarrow \boxed{x > a > 2}$
 $\hookrightarrow R_2 = (-2, 2)$

$f(x) = a^x + a x^2 + b x + c, (-2, -1)$

$f(x) = (a + x^2)^n - 1 \Rightarrow f(x) = (a + x^2)^n - 1$
 $\Rightarrow |f(x)| = |(a + x^2)^n - 1| \Rightarrow (-2, +\infty)$

$f(x) = x + \sqrt{x} - 2 \Rightarrow f'(x) \leq f(\sqrt{x}) \Rightarrow f(x) \leq \sqrt{x}$

$\Rightarrow x + \sqrt{x} - 2 \leq \sqrt{x} \Rightarrow x - 2 \leq 0 \Rightarrow x \leq 2 \Rightarrow D_x = \{0, 1, 2\}$

$f(x) = \sqrt[3]{9 \cos^2 x - 1} - \sqrt[3]{1 - 9 \cos^2 x} \Rightarrow \sqrt[3]{1 - 1} - \sqrt[3]{1 - 1} \Rightarrow \sqrt[3]{0} - \sqrt[3]{0} \Rightarrow \frac{1}{\sqrt[3]{2}}$

$x > 0 \Rightarrow \max \sqrt[3]{9 \cos^2 x - 1} \Rightarrow \cos x = \pm 1 \Rightarrow \sqrt[3]{9 - 1} = \sqrt[3]{8} \Rightarrow \sqrt[3]{8} - \frac{1}{\sqrt[3]{2}} = \frac{7}{\sqrt[3]{2}}$

$x < 0 \Rightarrow \min \Rightarrow \cos x = 0 \Rightarrow \sqrt[3]{0 - 1} = -1 \Rightarrow -1 - \frac{1}{\sqrt[3]{2}} \Rightarrow -\frac{\sqrt[3]{2} + 1}{\sqrt[3]{2}}$

$\Rightarrow [a, b] \Rightarrow [-\frac{1}{\sqrt[3]{2}}, \frac{7}{\sqrt[3]{2}}] \Rightarrow b - a = \frac{10}{\sqrt[3]{2}} + \frac{1}{\sqrt[3]{2}} = \frac{11}{\sqrt[3]{2}}$

$f(x) = x - [x + 2] \Rightarrow R_f = [-2, 1] \Rightarrow g \circ f(x) = \sqrt[3]{x - [x + 2]}$

$g(x) = \sqrt[3]{\frac{x - 2}{x}} \Rightarrow \sqrt[3]{\frac{x - 2}{x + 1}}$

$= \sqrt[3]{\frac{x - [x] - 2}{x - [x] - 2}} \Rightarrow \begin{cases} g \circ f(x) \max \Rightarrow g(-1) \Rightarrow \frac{1}{\sqrt[3]{2}} - 2 = -\frac{11}{\sqrt[3]{2}} \\ g \circ f(x) \min \Rightarrow g(-2) \Rightarrow \frac{1}{\sqrt[3]{2}} + 2 = \frac{5}{\sqrt[3]{2}} \end{cases}$