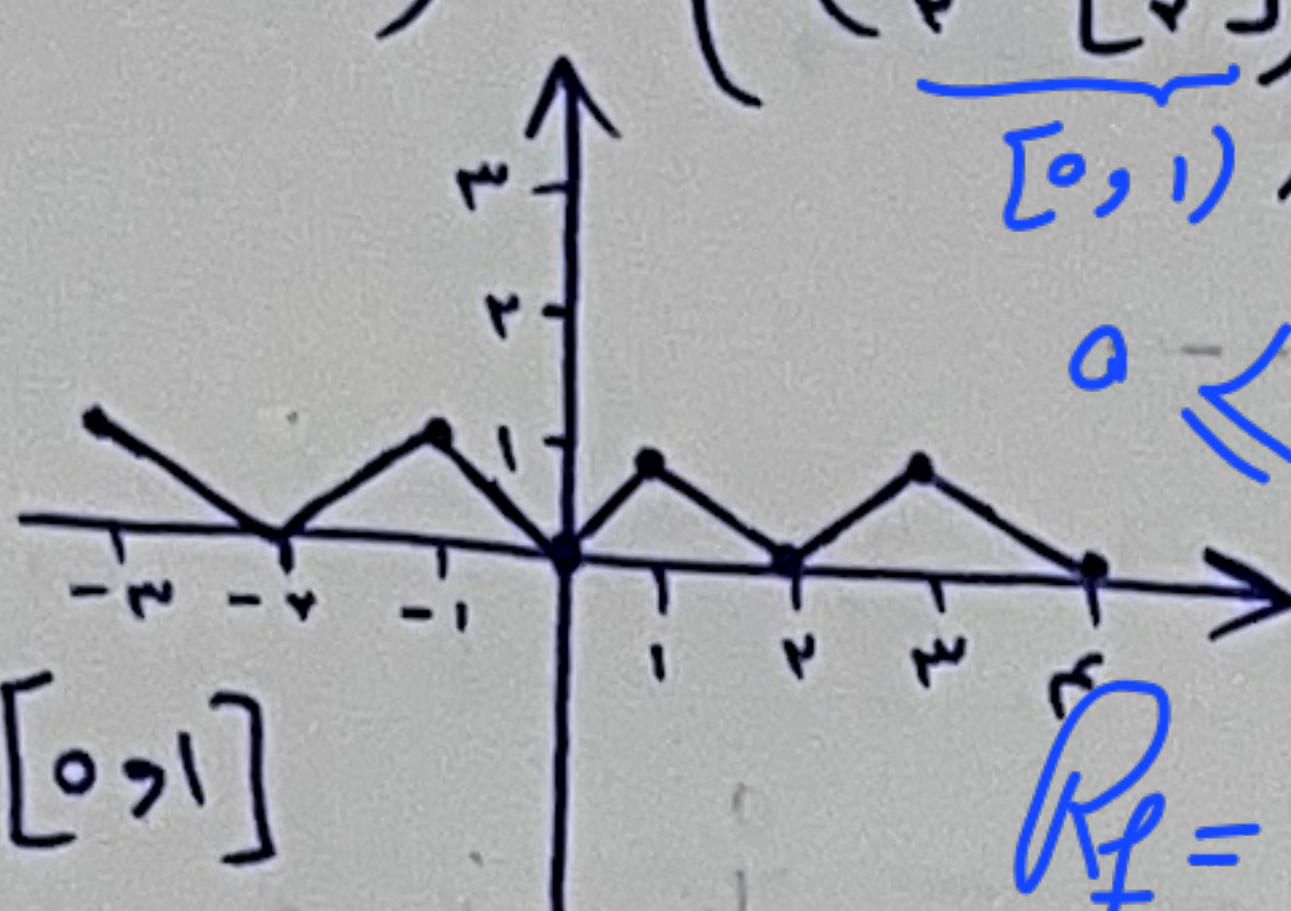


$$y = \left(x - 2\left[\frac{x}{2}\right]\right)^2 = \left(2\left(\frac{x}{2} - \left[\frac{x}{2}\right]\right)\right)^2$$


$R_f = [0, 1]$

$$y - \sin x + \log y - 4 = 0$$

$$\log y = \sin x + 4 \rightarrow \sin x = -1 \rightarrow \log y = 3$$

$$\sin x = 1 \rightarrow \log y = 5$$

$$3 \leq \log y \leq 5$$

$R_f = [1, \dots, 100000]$

$$f(x) = \sqrt{\frac{x^2 - 4}{x^2 - 9}}$$

$$y^2 = \frac{x^2 - 4}{x^2 - 9} \rightarrow x^2 = \frac{-4y^2 + 4}{y^2 - 1} = \frac{4y^2 - 4}{y^2 - 1} \rightarrow x = \pm \sqrt{\frac{4y^2 - 4}{y^2 - 1}}$$

$R_f = [a, b] \cup (c, +\infty)$

$a + b + c = \frac{1}{2}$

$$R_f = \left[-\frac{2}{3}, \frac{2}{3}\right] \cup (1, +\infty)$$

$(I) \cap (II) \rightarrow R_f = \left[0, \frac{2}{3}\right] \cup (1, +\infty)$

$$f(x) = x + \frac{1}{x} + 2\sqrt{x + \frac{1}{x}} + 1 - 1$$

$$\rightarrow \left(\sqrt{x + \frac{1}{x}} + 1\right)^2 - 1$$

نظر بر تابع $\sqrt{x + \frac{1}{x}}$ $\min \sqrt{x + \frac{1}{x}} = \sqrt{2}$ $\max = \infty$

بر تابع را تغییر نمی دهی

$R_f = [2 + \sqrt{2}, +\infty)$

$$y = (2 - \sin x)(1 + \sin x)$$

$$\sin x = 1 \rightarrow y = 1$$

$$\sin x = -1 \rightarrow y = 3$$

$R_f = [1, 3]$

$$f(x) = -\frac{1}{x}x + 10$$

$D_f = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$x=1 \rightarrow y=9 + \frac{1}{1}$
 $x=2 \rightarrow y=9 + \frac{1}{2}$
 $x=3 \rightarrow y=9$
 $x=4 \rightarrow y=8 + \frac{1}{4}$
 $x=5 \rightarrow y=7 + \frac{1}{5}$
 $x=6 \rightarrow y=6 + \frac{1}{6}$
 $x=7 \rightarrow y=5 + \frac{1}{7}$
 $x=8 \rightarrow y=4 + \frac{1}{8}$
 $x=9 \rightarrow y=3 + \frac{1}{9}$

$R_f = \left\{\frac{11}{3}, \frac{17}{6}, \dots, \frac{19}{9}\right\}$

جمع y ها

$$S = \frac{n}{p}(a_1 + a_n)$$

$\Rightarrow 72$

$$S = \frac{9}{2} \left(\frac{11}{3} + \frac{19}{9}\right) = 72$$

$$f(x) = \sqrt{ax^2 + bx + c} \rightarrow D_f = [2, +\infty)$$

$a(x-2)^2 \rightarrow f(2) = 1 \rightarrow a = 1$

$$f(x) = \sqrt{x^2 - 4x + 4} \rightarrow a=1, b=-4, c=4$$

$$g(x) = \sqrt{-4x^2 + x - 1} \rightarrow \Delta < 0$$

همواره منفی است

$g(x) = \sqrt{4x^2 + 4}$ $\min \left| \frac{0}{4} \right| = 0$ $\rightarrow R = [2, +\infty)$

چون دامنه 2 است پس رابطه مایک

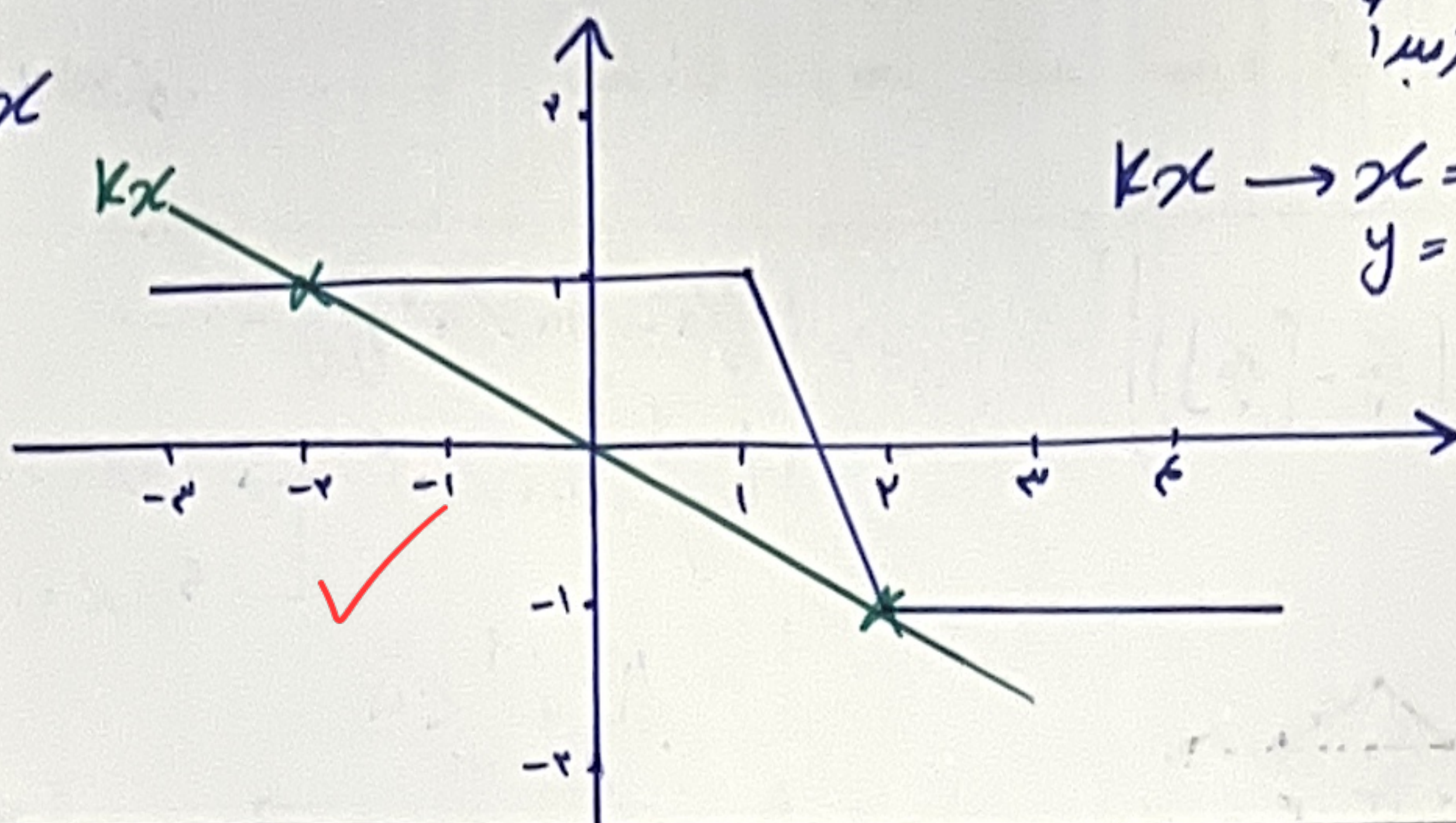
تابع خطی است $a=0$

$f(2) = 0 \rightarrow b = 1$

$f(3) = 1 \rightarrow c = -2$

$$|x-2| - |x-1| = kx$$

$$\begin{aligned} x=2 &\rightarrow y=-1 \\ x=1 &\rightarrow y=-1 \\ x=1 &\rightarrow y=1 \\ x=0 &\rightarrow y=1 \end{aligned}$$



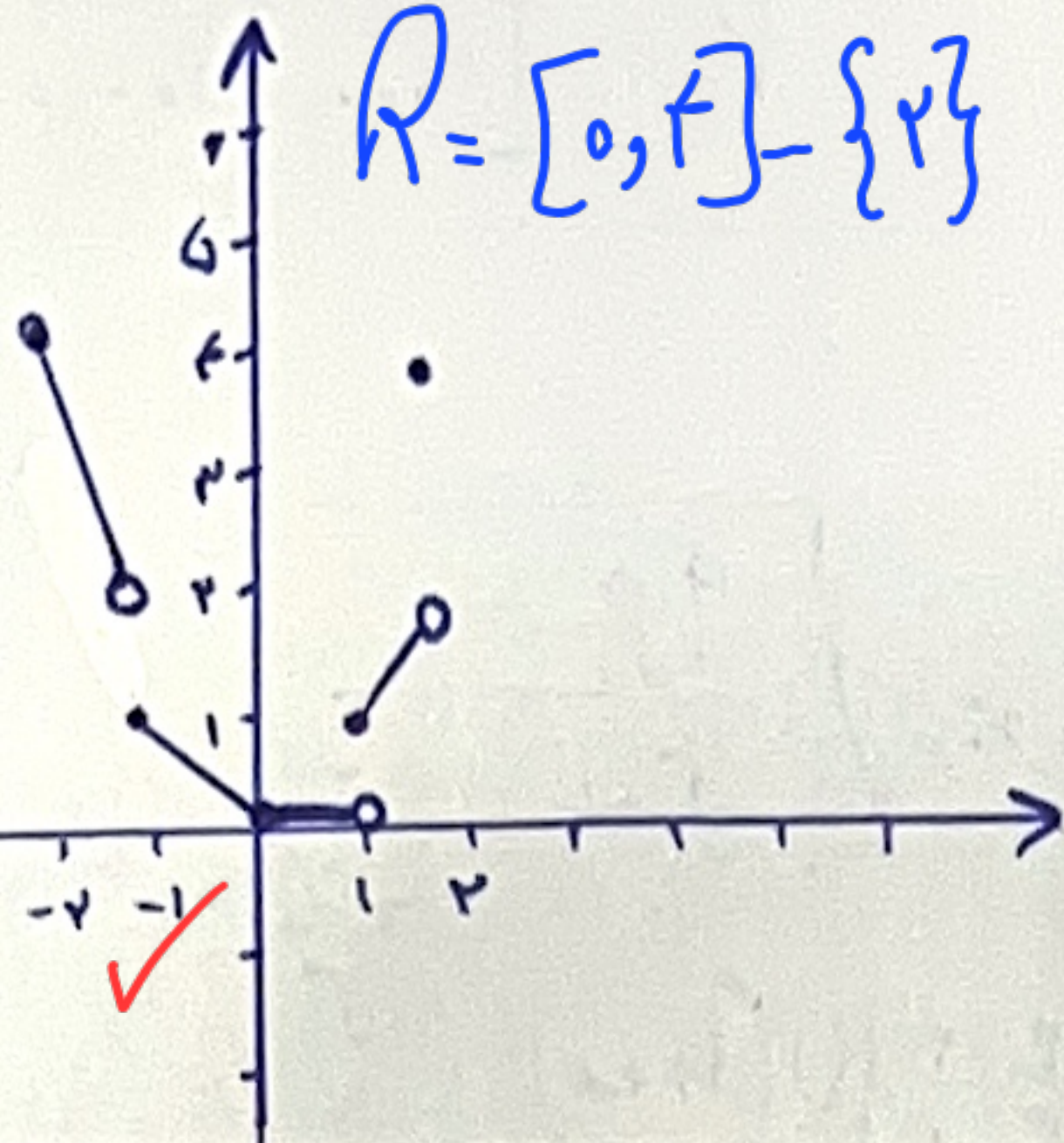
$$kx \rightarrow x = -2, y = 1 \} \rightarrow k = -\frac{1}{2}$$

(2)

$$y = x[x]$$

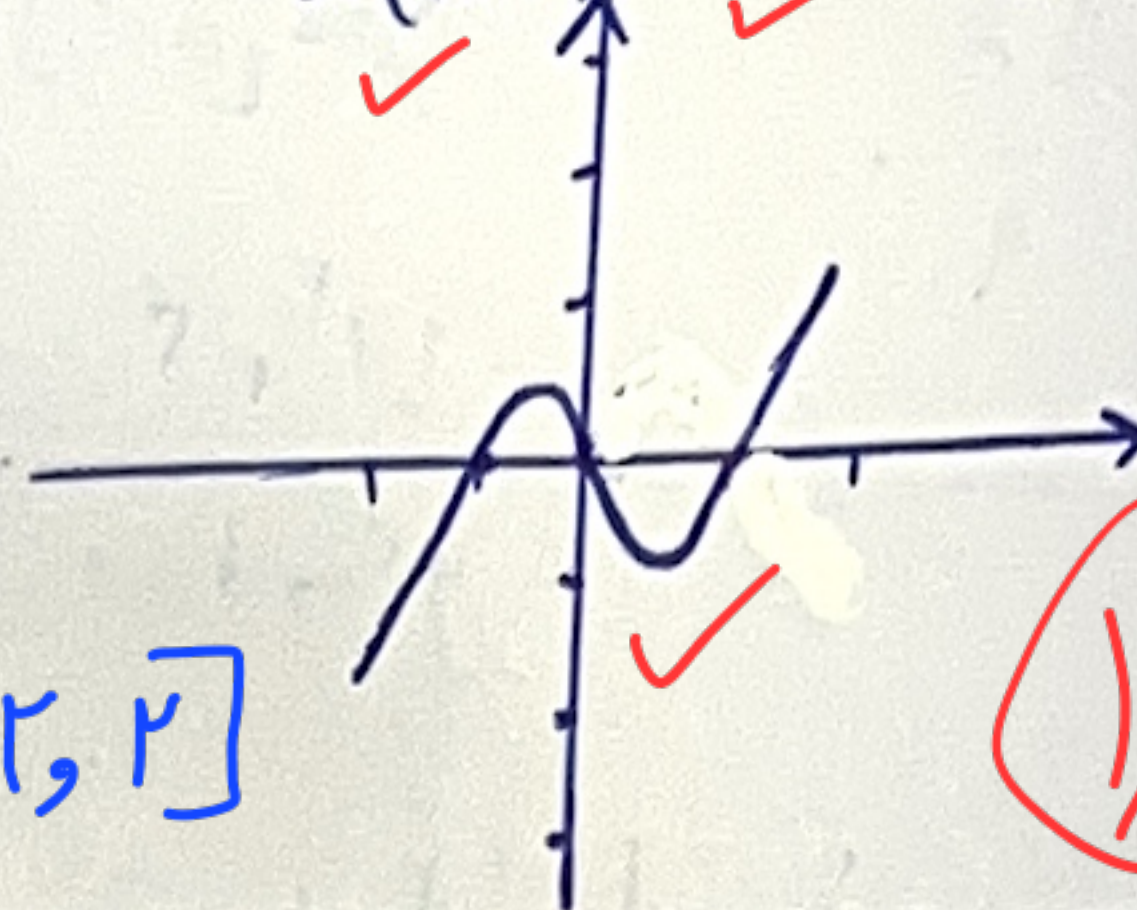
$$R = [0, 4] - \{2\}$$

$$\begin{aligned} -1 < x < 1 &\rightarrow -x \\ -1 < x < 0 &\rightarrow -x \\ 0 < x < 1 &\rightarrow 0 \\ 1 < x < 2 &\rightarrow x \\ x=2 &\rightarrow 0 \end{aligned}$$



$$y = x|x| - x$$

$$\begin{aligned} -x^2 - x &= -x(x+1) \\ x^2 - x &= x(x-1) \end{aligned}$$



$$R = [-1, 1]$$

(1,0)

$$y = \frac{1}{x} + \frac{1}{x+1} + \frac{1}{x^2+x} \rightarrow \frac{x+x+1+x}{x(x+1)} \rightarrow \frac{2(x+1)}{x(x+1)} \rightarrow x \neq -1 \rightarrow y = \frac{2}{x}$$

$$x = \frac{2}{y} \rightarrow y \neq 0$$

$$x = -1 \rightarrow y = \frac{2}{-1} = -2$$

$$R_f = \mathbb{R} - \{0, -2\}$$

$$a+b = -2$$

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

$$\left(\frac{\sqrt{x}-1}{\sqrt{x}-1}\right)^2 - \left(\frac{1}{\sqrt{x}-1}\right)^2 = \left(\frac{\sqrt{x}-1}{\sqrt{x}-1}\right) \left(\frac{\sqrt{x}-1-1}{\sqrt{x}-1}\right) = \frac{(\sqrt{x}-1)(\sqrt{x}-2)}{(\sqrt{x}-1)(\sqrt{x}-1)} \xrightarrow{x \neq 1} \frac{\sqrt{x}-2}{\sqrt{x}-1}$$

$$y = \frac{\sqrt{x}-2}{\sqrt{x}-1} \rightarrow \sqrt{x} = \frac{-y+2}{y-1} \rightarrow \sqrt{x} = \frac{y-2}{y-1} \rightarrow \frac{1}{y-1} - \frac{2}{y-1} \rightarrow R_f = (-\infty, 1) \cup [2, +\infty)$$

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

$$\text{این تابع از } x+2 \text{ است, } x \neq \pm 1$$

$$\begin{aligned} x=1 &\rightarrow y=3 \\ x=-1 &\rightarrow y=1 \end{aligned}$$

$$3+1=4$$

(2)

در $x = \pm 1$ تعریف نمی شود. برد: بازای y این دو x تعریف نمی شود.