

19, 20

$$\sin^2(x + \frac{\pi}{2}) \begin{matrix} \text{max} \\ 1 \\ \text{min} \\ 0 \end{matrix}$$

$$\Rightarrow y \sin^2(x + \frac{\pi}{2}) - 1 \begin{matrix} \text{max} \\ y - 1 = 1 \\ 0 - 1 = -1 \end{matrix}$$

(الف) ٢

P

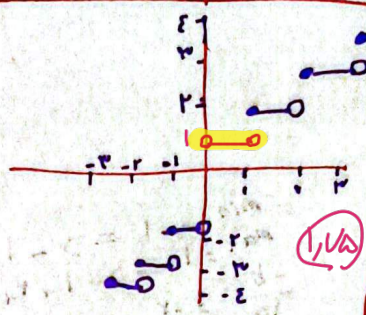
$$R_f = [-1, 1]$$

$$\cos^2 x \begin{matrix} \text{max} \\ 1 \\ \text{min} \\ -1 \end{matrix} \Rightarrow$$

$$y \cos^2 x - \varepsilon \begin{matrix} \text{max} \\ y - \varepsilon = -1 \\ -y - \varepsilon = -v \end{matrix}$$

(ب)

$$[x] - 1 \quad 0 \quad 1 + [x]$$



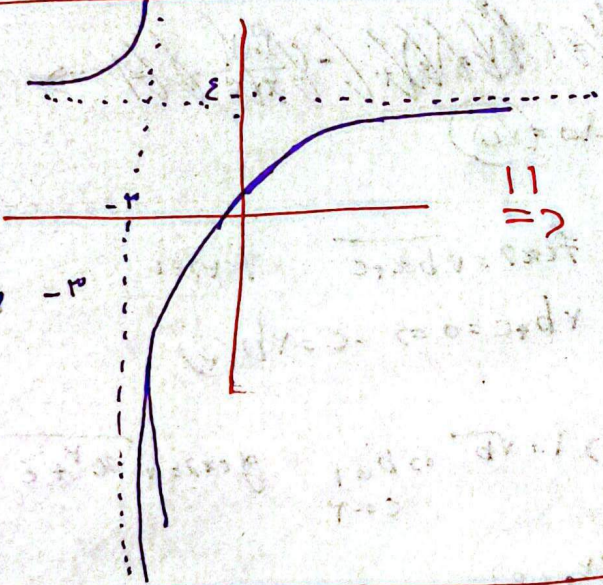
$$R_f = [-v, -1]$$

(١, ١٨)

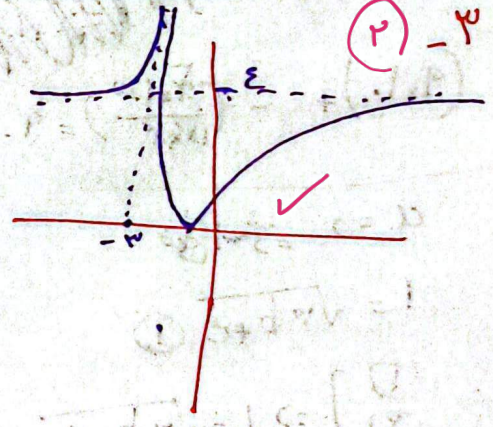
- ٢

$$y = \frac{\varepsilon x + 1}{x + 2}$$

$$\frac{\varepsilon}{1} = \varepsilon, -v$$

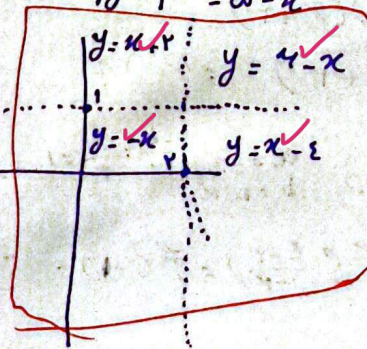


11 =>

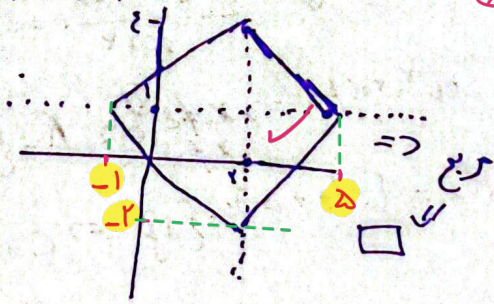


(٢) - ٣

$$x \quad y \quad |y-1| = x+1 \quad |y-1| = \omega - x$$



$$y = |x-1| - \varepsilon \quad y = \varepsilon - |x-1|$$



(١, ١٨)

- ٤

الف) $x + \frac{1}{x} \geq 2 \checkmark \Rightarrow x + \frac{1}{x} + 2\sqrt{x \cdot \frac{1}{x}} \Rightarrow \min \Rightarrow 2$ (2)
 $x < 0 \Rightarrow x + \frac{1}{x} \leq -2 \Rightarrow x \leq -2$
 خذ عتق x ، اذیکال منی یستور بعدا

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

ب) $y = -\sin^2 x + 2 \sin x + 3$

$\min = -1 \Rightarrow -1 - 2 + 3 = 0$
 $\max = 1 \Rightarrow 1 - 2 + 3 = 2$
 $\frac{-b}{2a} = \frac{-2}{-2} = 1 \Rightarrow -1 + 2 + 3 = 4$
 $\Rightarrow R_f = [0, 4]$

ج) $(-\frac{1}{3} + 1.0) + (-\frac{2}{3} + 1.0) + (-1 + 1.0) + (-\frac{4}{3} + 1.0) + (-\frac{5}{3} + 1.0) + (-\frac{7}{3} + 1.0) + (-\frac{8}{3} + 1.0) + (-\frac{9}{3} + 1.0) + (-\frac{1}{3} + 1.0) + (-2 + 1.0)$
 $\Rightarrow (9, 1.0) + -(\frac{5 \times 1.0}{1 \times 2 \times 3}) = 9 - 1.0 = 8$ (2)

د) $a = 0 \checkmark$ ضعیف

$f(x) = \sqrt{bx+c}$ $f(0) = 1$

(2) - 1
 $2 \sqrt{bx+c}$

$1 = \sqrt{3b+c}$ (1)

$2b+c=0 \Rightarrow -c=2b$ (2)

(1) $\Rightarrow 1 = \sqrt{3b-2b} \Rightarrow 1 = \sqrt{b} \Rightarrow b=1$
 $c=-2$
 $g(x) = \sqrt{x^2 + 2} \Rightarrow$

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

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

$x^2 - x + 1 \Rightarrow x \neq 1$ (2) $R = \{-1, 1\}$
 $\frac{-b}{2a} = \frac{-1}{2} = -\frac{1}{2} \Rightarrow 1 - \frac{1}{2} = \frac{1}{2}$

$R_f = [-1, +\infty) - \{1\} \Rightarrow C = 1$
 $f(\frac{1-2}{-1}) = f(-1) = \frac{-1+1}{1} = 0$ (3)

$$x^3 + ax^2 + bx - 1 = (x + \alpha)^3 \Rightarrow \alpha^3 = -1$$

$$\alpha = -1 \quad b = (-1)^2 \times 3 = 3$$

$$a = 3 \times 1 = 3 \Rightarrow$$

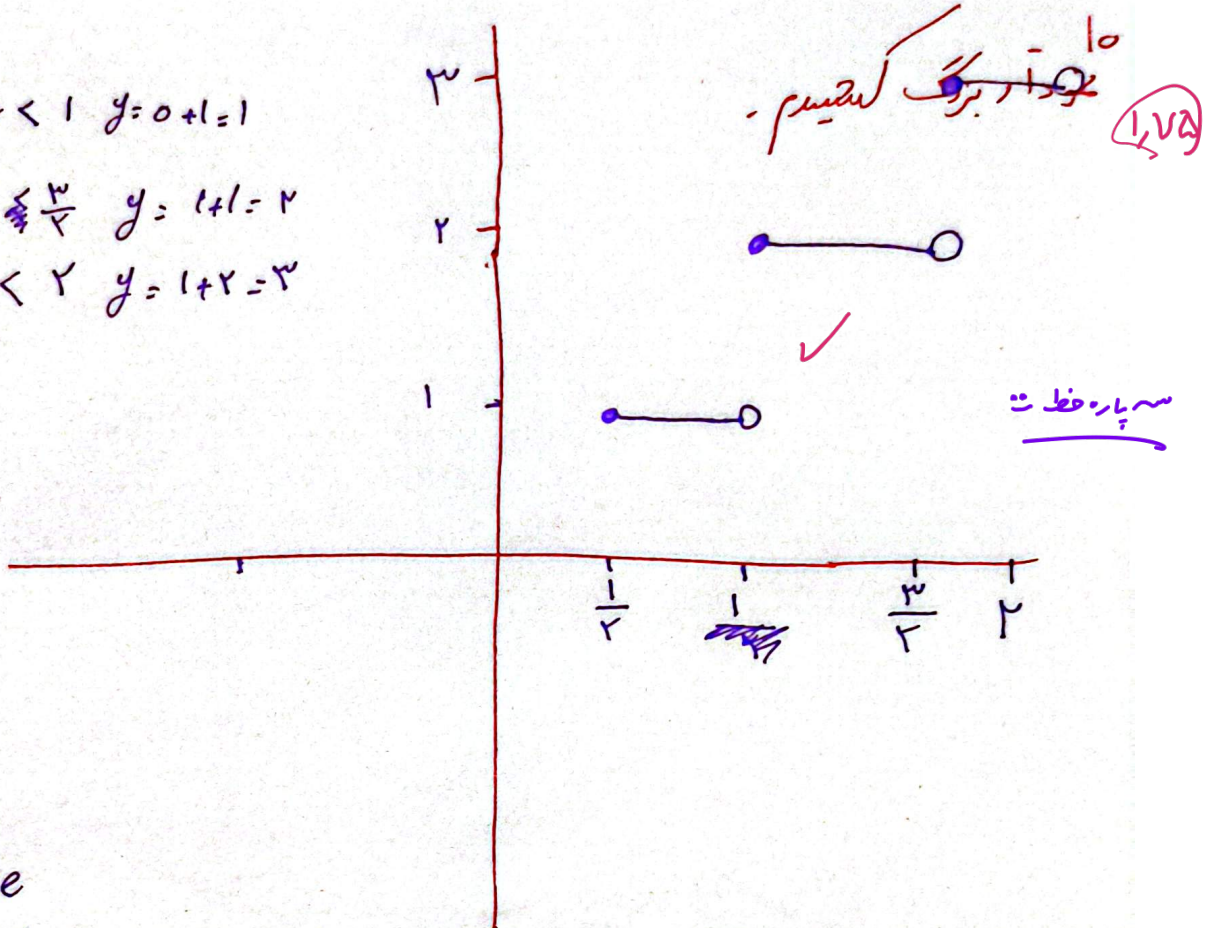
$$y = \sqrt[3]{(x-1)^3} = x-1$$

$$R_f = [f(-1), f(1)] = [-1, 1]$$

$$\frac{1}{3} \leq x < 1 \quad y = 0+1=1$$

$$1 \leq x \leq \frac{2}{3} \quad y = 1+1=2$$

$$\frac{2}{3} < x < 1 \quad y = 1+2=3$$



Reze

