

$$y = (x - 2\left[\frac{x}{2}\right])^2 = (2\left(\frac{x}{2} - \left[\frac{x}{2}\right]\right))^2 \quad R_y = [0, 4]$$

$0 \leq \frac{x}{2} < 1$
 $0 \leq x < 2$

$$b) -\sin x + \log y - x = 0$$

$$\log y = \sin x + x$$

$$\Rightarrow 10^3 \leq y \leq 10^5 \quad 10^3 \leq \sin x + x \leq 10^5$$

$$f(x) = \sqrt{\frac{x^2 - 9}{x^2 - 9}} \quad [a, b] \cup (c, +\infty) \quad a + b + c = ?$$

$$\infty \Rightarrow 1 \Rightarrow \sqrt{\frac{x^2 - 9}{x^2 - 9}} \cup (1, +\infty) = [0, \frac{2}{3}] \cup (1, +\infty)$$

$$0 \Rightarrow \frac{9}{9}$$

$$0 + \frac{2}{3} + 1 = \frac{5}{3}$$

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

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

$$= (\sqrt{x + \frac{1}{x}} + 1)^2 - 1 \quad R_y = [1 + 2\sqrt{2}, +\infty)$$

$$\min = (\sqrt{2} + 1)^2 - 1 = 2 + 1 + 2\sqrt{2} - 1 = 2 + 2\sqrt{2}$$

$$y = (3 - \sin x)(1 + \sin x)$$

$$= -\sin^2 x + 3\sin x + 3$$

$$\sin x = 1 \quad -1 + 3 + 3 = 5$$

$$\sin x = -1 \quad -1 - 3 + 3 = -1$$

$$\sin x = -\frac{b}{a} = -\frac{3}{1} = -3 \quad \text{Not possible}$$

$$R_y = [0, 5]$$

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

$$-\frac{1}{10}(1 + 2 + \dots + 9) + 90$$

$$-\frac{1}{10}\left(\frac{9 \times 10}{2}\right) + 90 = -15 + 90 = 75$$

$$f(x) = \sqrt{ax^2 + bx + c} \quad D_f = [1, +\infty) \quad f(1) = 1 \quad g(x) = \sqrt{bx^2 + ax - 1}$$

$$a = 0$$

$$f(1) = \sqrt{b + c} = 1 \Rightarrow b + c = 1 \Rightarrow b = 1, c = 0$$

$$bx + c \geq 0 \Rightarrow x \geq -\frac{c}{b} \Rightarrow -\frac{c}{b} = 1$$

$$c = -b$$

$$g(x) = \sqrt{x^2 + 1}$$

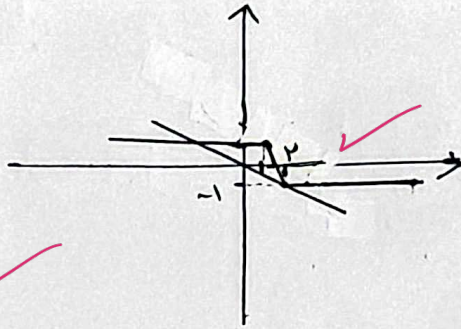
$$x_0 = 0 \Rightarrow y_0 = 1$$

$$R_g = \sqrt{[1, +\infty)} = [1, +\infty)$$

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

$$pk = -1$$

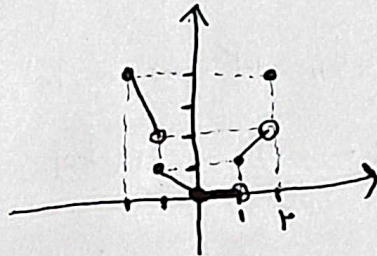
$$k = -\frac{1}{p}$$



2

$$1) y = x[x] \quad [-2, 2]$$

$$\begin{cases} -2x & -2 \leq x < -1 \\ -x & -1 \leq x < 0 \\ 0 & 0 \leq x < 1 \\ x & 1 \leq x \leq 2 \\ \Sigma & x=2 \end{cases}$$

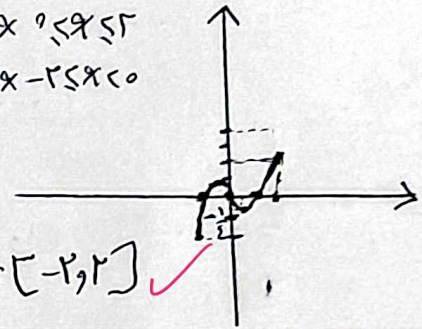


$$R_y = [0, 2] \cup \{2\}$$

$$y = x|x| - x \quad [-2, 2]$$

$$x^2 - x \quad 0 \leq x \leq 2$$

$$-x^2 - x \quad -2 \leq x < 0$$



$$R_y = [-2, 2]$$

$$y = \frac{1}{x} + \frac{1}{x+1} + \frac{1}{x^2+x} \Rightarrow y = \frac{p(x+1)}{x^2+x} + \frac{p(x+1)}{x(x+1)} = \frac{p}{x}$$

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

$$-2 = \frac{p}{-1} \notin R_y$$

$$0 + -p = -2$$

2

1

$$f(x) = \frac{(\sqrt{x}-1)(\sqrt{x}-1^0)}{(\sqrt{x}-1)^2} = \frac{\sqrt{x}-1^0}{\sqrt{x}-1}$$

خرج كل منسوبة

$$\Rightarrow x=0 \Rightarrow 1^0$$

$$\Rightarrow +\infty \Rightarrow 1$$

$$R_f = (-\infty, 1) \cup [1^0, +\infty)$$

2

9

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

مجموع قوى (x-1) / مجموع قوى (x+1)

$$x^p + 2x^2 - x - 2 \quad \frac{x^2-1}{x+2}$$

$$x \neq \pm 1 \Rightarrow f(x) = x+2$$

$$R_f = \mathbb{R} - \{1, -1\}$$

$$1 + 1^0 = 2$$

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

$$1+2=1^0$$

$$-1+2=1$$

2

1