

الف) $y = \left[\underbrace{2\left(\frac{x}{2} - \left[\frac{x}{2}\right]\right)}_{[0,1]} \right]^2 \Rightarrow y = [0,4]$

ب) $\log y = \frac{\sin x + 4}{[2,5]} \Rightarrow y = [10^3, 10^5]$

$y = \frac{x^2 - 4}{x^2 - 9} \Rightarrow \begin{cases} x^2 = 0 \Rightarrow \frac{4}{9} \\ x^2 = 9 \Rightarrow 1 \end{cases} \Rightarrow (-\infty, \frac{4}{9}) \cup (1, +\infty) \xrightarrow{\sqrt{\cdot}} [0, \frac{2}{3}] \cup (1, +\infty)$

$a = 0$

$b = \frac{1}{10} \Rightarrow a + b + c = a + \frac{1}{10} + 1 = \frac{11}{10}$

$c = 1$

الف) $f(x) = x + \frac{1}{x} + 2\sqrt{x + \frac{1}{x}} + 1 - 1 = \left(\sqrt{x + \frac{1}{x}} + 1\right)^2 - 1$
 $x + \frac{1}{x} \geq 2 \Rightarrow (\sqrt{x + \frac{1}{x}})^2 - 1 = 3 + 2\sqrt{x + \frac{1}{x}} - 1 = 2\sqrt{x + \frac{1}{x}} + 2 \Rightarrow R_f = [2\sqrt{2} + 2, +\infty)$

ب) $y = 3 + 3\sin x - \sin x - \sin^2 x = -\sin^2 x + 2\sin x + 3$
 $\Rightarrow R_f = [0, 4]$

$\begin{cases} \sin x = -1 \Rightarrow -1 - 1 + 3 = 0 \\ \sin x = 1 \Rightarrow -1 + 2 + 3 = 4 \\ \sin x = \frac{1}{2} \Rightarrow -\frac{1}{4} - 1 + 3 = \frac{5}{4} \end{cases}$

$-\frac{1}{10} + 10 + \frac{-2}{10} + 10 + \frac{-10}{10} + 10 + \frac{-4}{10} + 10 + \frac{-10}{10} + 10 + \frac{-2}{10} + 10 + \frac{-1}{10} + 10$
 $+ \frac{-9}{10} + 10 = \frac{-(1+2+10+9)}{10} + 9 \times 10 = \frac{-14}{10} + 90 = -1.4 + 90 = 88.6$

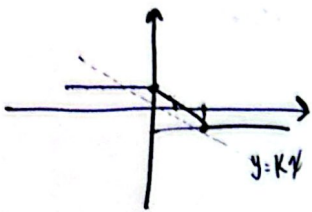
درجه ۲: $ax^2 + bx + c$ است. پس یارینه مضاعف دارد یا معادله یک است و آثرینه مضاعف برده می‌شود. این تابع بود پس $a=0$ است

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

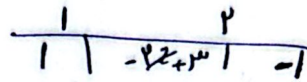
$f(1) = 0 \Rightarrow 2b + c = 0$

$f(4) = 1 \Rightarrow 4b + c = 1 \Rightarrow b = 1 \quad c = -2$

$g(x) = \sqrt{x^2 + 4} \Rightarrow R_g = [2, +\infty)$



$$y = Kx \Rightarrow K = -1 \Rightarrow K = -\frac{1}{x}$$



6

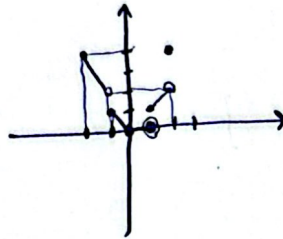
$$a) x(x-1) \Rightarrow y = -x^2$$

$$-1(x-0) \Rightarrow y = -x$$

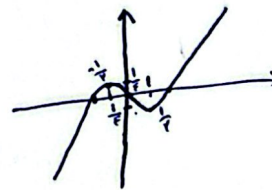
$$0(x-1) \Rightarrow y = 0$$

$$1(x-1) \Rightarrow y = x$$

$$x-1 \Rightarrow y = x^2$$



$$b) y = \begin{cases} x^2 - x & x > 0 \\ -x^2 - x & x < 0 \end{cases}$$



7

$$y = \frac{x+1+x+1}{x^2+x} = \frac{2(x+1)}{x(x+1)} = \frac{2}{x} \xrightarrow{x \neq -1} R_f = R - \left\{ \frac{2}{-1}, 0 \right\} = R - \left\{ -2, 0 \right\}$$

$$a+b = -2+0 = -2$$

8

$$f(x) = \frac{(\sqrt{x}-1)(\sqrt{x}-3)}{(\sqrt{x}-1)^2} = \frac{\sqrt{x}-3}{\sqrt{x}-1} \quad \begin{matrix} \sqrt{x}=0 \Rightarrow 3 \\ \sqrt{x}=+\infty \Rightarrow 1 \end{matrix}$$

$$R_f = [3, +\infty) \cup (-\infty, 1)$$

9

$$f(x) = \frac{(x+1)(x-1)(x+1)}{(x-1)(x+1)} = x+1 \xrightarrow{x \neq -1} R_f = R - \{ -1, 1 \}$$

$$\Rightarrow x+1 = f$$

10