

الف) $x^2 = y + 5 \Rightarrow x = \sqrt{y+5} \quad y+5 \geq 0 \quad y \geq -5 \quad R = [-5, +\infty)$

$\rightarrow y = x^2 + 1 \quad x^3 = y - 1 \Rightarrow x = \sqrt[3]{y-1} \quad R = \mathbb{R}$

$y = x^2 - 4x + 5 + 2 \Rightarrow y = (x-2)^2 + 2 \Rightarrow y-2 = (x-2)^2$

$\Rightarrow \sqrt{y-2} = x-2 \Rightarrow x = \sqrt{y-2} + 2 \quad y-2 \geq 0 \quad y \geq 2 \quad R = [2, +\infty)$

$y = x^2 - 5x + 1 \rightarrow y = (x^2 - 5x + \frac{25}{4}) + 1 - \frac{25}{4} \rightarrow y = (x - \frac{5}{2})^2 + 1 - \frac{25}{4}$

$y = (x - \frac{5}{2})^2 - \frac{21}{4} \quad y + \frac{21}{4} = (x - \frac{5}{2})^2 \rightarrow x - \frac{5}{2} = \sqrt{y + \frac{21}{4}} \rightarrow x = \sqrt{y + \frac{21}{4}} + \frac{5}{2}$

$y = \frac{x^2 + 3}{x^2 - 1} \quad x^2 = \frac{-2y - 3}{y - 1} = \frac{2y + 3}{y - 1} \Rightarrow x = \sqrt{\frac{2y + 3}{y - 1}}$

$y = \frac{1}{x(x-4)} \rightarrow x^2 - 4x = \frac{1}{y} \rightarrow x^2 - 4x - \frac{1}{y} = 0 \quad \Delta = b^2 - 4ac$

$\frac{-b}{2a} = \frac{4}{2} = 2 \quad \min 9 - 11 + 2 = -6 \Rightarrow R = [-6, +\infty)$

$y = \frac{x^2}{x^2 + 4x + 2} \quad \frac{-b}{2a} = \frac{-4}{2} = -2 \quad \min 9 - 11 + 2 = -6 \Rightarrow R = [-6, +\infty)$

$$y = \sqrt{x^2 - 4x + 2} \quad \frac{-b}{2a} = \frac{4}{2} = 2$$

$$\min \rightarrow \sqrt{9 - 14 + 2} = \sqrt{-3} \quad \sqrt{[-\infty, \infty)} \Rightarrow R = [0, +\infty)$$

$$y = \sqrt{-x^2 + 4x + 10} \quad \frac{-b}{2a} = \frac{-4}{-2} = 2$$

$$\max \sqrt{-4 + 10 + 10} = \sqrt{16} \Rightarrow R = \sqrt{[-\infty, +14]} \Rightarrow R = [0, \sqrt{14}]$$

$$y = x^2 + 2x^2 + 2x + 1 \rightarrow R_f = R$$

$$y = \sqrt{x^2 + 4x^2 + 4x + 1}$$

$$R_f = \sqrt{(-\infty, \infty)} \Rightarrow R_f = [0, +\infty)$$

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

$$1(1) \neq 2(2) \Rightarrow R = R - \left\{ \frac{2}{1} \right\} \quad \frac{ax+b}{cx+d} \quad ad \neq cb \quad c \neq 0 \rightarrow R - \left\{ \frac{a}{c} \right\}$$

$$y = \sqrt{\frac{4x+1}{x+2}}$$

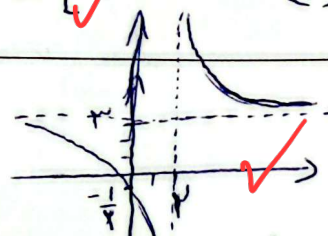
$$1(1) \neq 2(2)$$

$$R = \sqrt{R - \left\{ \frac{4}{1} \right\}} \Rightarrow R = [0, +\infty) - \left\{ 2 \right\}$$

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

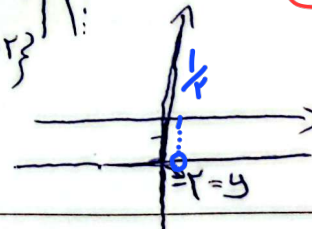
$$x = \frac{1}{3} \Rightarrow y = 2$$

$$y = \frac{a}{c} = \frac{3}{1} = 3$$



$$y = \frac{4x-2}{1-2x} = \frac{4x-4}{-2x+1} = -2 \Rightarrow y = -2 \quad R_f = \{-2\}$$

$$x \neq \frac{1}{2}$$



$$y = \cos^2 x + \frac{1}{\cos^2 x}$$

به خاطر توان دو وجهی اعداد منفی مثبت می شوند

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

$$y = \sqrt[3]{\frac{x^2+1}{x}} = \sqrt[3]{x + \frac{1}{x}}$$

لا بد که فرجه سه قرار گرفتن عبارت منفی زیر آن را منع می کند

$$R_f \sqrt[3]{(-\infty, -2)} \cup [2, +\infty) \quad R_f = (-\infty, \sqrt[3]{-2}] \cup [\sqrt[3]{2}, +\infty)$$