

الف) $y = x^2 - d$ $x^2 - y + d \Rightarrow x = \pm \sqrt{y+d}$ $\Rightarrow y+d \geq 0 \Rightarrow y \geq -d$ $\Rightarrow R_f = [-d, \infty)$	ب) $y = x^2 + 1$ $x^2 = y-1 \Rightarrow x = \pm \sqrt{y-1} \Rightarrow R_f = [1, \infty)$	۱
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الف) $y = x^2 - 4x + 4$ $y = x^2 - 4x + 4 \Rightarrow y = (x-2)^2 + 2$ $\Rightarrow (x-2)^2 = y-2 \Rightarrow x = \pm \sqrt{y-2} + 2$ $\Rightarrow y-2 \geq 0 \Rightarrow y \geq 2 \Rightarrow R_f = [2, \infty)$	ب) $x^2 - 4x + 1 = y$ $\Rightarrow y = x^2 - 4x + \frac{16}{4} - \frac{15}{4}$ $\Rightarrow y = (x-2)^2 - \frac{15}{4}$ $\Rightarrow x - \frac{8}{4} = \pm \sqrt{y + \frac{15}{4}}$ $\Rightarrow x = \pm \sqrt{y + \frac{15}{4}} + \frac{8}{4} \Rightarrow R_f = [-\frac{15}{4}, \infty)$	۲
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الف) $y = \frac{x^2 + 3}{x^2 - 2}$ $y(x^2 - 2) = x^2 + 3 \Rightarrow yx^2 - 2y = x^2 + 3$ $\Rightarrow x^2(y-1) = 2y+3 \Rightarrow x^2 = \frac{2y+3}{y-1}$ $\Rightarrow x = \pm \sqrt{\frac{2y+3}{y-1}} \Rightarrow R_f = (1, \infty)$	ب) $y x - 4y = 2 x + 1$ $\Rightarrow y x - 2 x = 4y + 1 \Rightarrow x (y-2) = 4y+1 \Rightarrow x = \frac{4y+1}{y-2}$ $\Rightarrow R_f = (2, \infty)$	۳
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$y x^2 - 4x y = 1$ $\Delta = 16y^2 + 4y$ $(y) x^2 - (4y)x - 1 = 0$ $x = \frac{4y \pm \sqrt{16y^2 + 4y}}{2y} \Rightarrow y \neq 0, 16y^2 + 4y \geq 0 \Rightarrow 16y^2 + 4y > 0 \Rightarrow 4y^2 + y > 0 \Rightarrow 4y^2 > -y$ برای $y > 0$ هر دو طرف را بر y تقسیم می‌کنیم.	$R_f = \mathbb{R} - \{0\}$ $\uparrow$	۴
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الف) $y = x^2 - 4x + 2$ $\min \left \frac{-a}{2a} = \frac{-(-4)}{2} = 2 \Rightarrow R_f = [2, \infty)$ $\Delta = b^2 - 4ac = 16 - 4 = 12$	ب) $y = x^2 + 4x + 2$ $\max \left \frac{-a}{2a} = \frac{-4}{2} = -2 \Rightarrow R_f = (-\infty, 2]$ $\Delta = 16 - 4 = 12$	۵
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$$الف) y = \sqrt{x^2 - 4x + 7}$$

$$R_f = \sqrt{[-1, +\infty)} \Rightarrow R_f = [0, +\infty)$$

$$ب) y = \sqrt{-x^2 + 4x + 7}$$

$$R_f = [0, 4]$$

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

$$R_f = \mathbb{R}$$

$$ب) y = \sqrt{x^2 + 4x^2 + 4x + 1}$$

$$\Rightarrow R_f = \sqrt{\mathbb{R}} \Rightarrow R_f = [0, +\infty)$$

$$الف) R_f = \mathbb{R} - \{r\}$$

$$ب) R_f = [0, +\infty) - \{r\}$$

$$الف) R_f = \mathbb{R} - \{r\}$$

$$ب) R_f = \mathbb{R} - \{r\}$$

$$الف) y = \cos^2 x + \frac{1}{\cos^2 x} \Rightarrow R_f = [1, +\infty)$$

$$ب) y = \sqrt{\frac{x^2 + 1}{x}} \Rightarrow y = \sqrt{x + \frac{1}{x}} \quad R_f = (-\infty, -1] \cup [1, +\infty)$$