

$$1) y = x^2 - 5 \rightarrow x^2 = y + 5 \rightarrow x = \sqrt{y+5} \rightarrow y+5 \geq 0$$

$$y \geq -5 \quad R_f = [-5, +\infty)$$

$$2) y = x^2 + 1 \rightarrow x^2 = y - 1 \rightarrow x = \sqrt{y-1} \rightarrow R_f = \mathbb{R}$$

$$3) x^2 - 6x + 4 = x^2 - 6x + 9 - 5 \rightarrow (x-3)^2 - 5 = y \rightarrow (x-3)^2 = y+5 \rightarrow$$

$$x-3 = \pm\sqrt{y+5} \rightarrow y \geq -5$$

$$4) x^2 - 5x + 1$$

$$x^2 - 5x + 1 - y = 0$$

$$\Delta = b^2 - 4ac \rightarrow 25 - 4(1-y) = 25 - 4 + 4y = 21 + 4y \quad R_f = \left[-\frac{21}{4}, +\infty\right)$$

$$x = \frac{5 \pm \sqrt{21+4y}}{2} \rightarrow 21+4y \geq 0 \rightarrow 4y \geq -21 \rightarrow \boxed{-\frac{21}{4} \leq y}$$

$$5) y = \frac{x^2+3}{x^2-2} \rightarrow \frac{x^2+3}{x^2-2} = y \rightarrow \frac{-2y-3}{y-1} = x^2 \rightarrow x = \sqrt{\frac{2y+3}{y-1}}$$

$$R_f = (-\infty, -\frac{3}{2}] \cup (1, +\infty)$$

$$6) y = \frac{2|x|+1}{|x|-5} \rightarrow \frac{2|x|+1}{|x|-5} = y \rightarrow \frac{-5y-1}{y-2} = |x| \rightarrow$$

$$R_f = (-\infty, -\frac{1}{5}] \cup (2, +\infty)$$

$$7) y = \frac{1}{x^2-4x} \rightarrow yx^2 - 4xy = 1 \rightarrow yx^2 - 4xy - 1 = 0$$

$$\Delta = b^2 - 4ac \rightarrow 16y^2 + 4y$$

$$= \frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \frac{4y \pm \sqrt{16y^2+4y}}{2y}$$

$$\rightarrow 16y^2+4y \geq 0 \rightarrow 4y(y+1) \geq 0$$

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

الف) $y = x^2 - 4x + 2 \rightarrow \min \left| \frac{-b}{2a} = \frac{4}{2} = 2 \right| \quad R_f = [-2, +\infty)$

ب) $y = -x^2 + 4x + 2 \rightarrow \max \left| \frac{-b}{2a} = \frac{-4}{-2} = 2 \right| \quad R_f = (-\infty, 4]$

الف) $y = \sqrt{x^2 - 4x + 2} \quad \min \left| \frac{-b}{2a} = \frac{4}{2} = 2 \right| \quad R_f = \sqrt{[-2, +\infty)} = [0, +\infty)$

ب) $y = \sqrt{-x^2 + 4x + 6} \quad \max \left| \frac{-b}{2a} = \frac{-4}{-2} = 2 \right| \quad R_f = \sqrt{(-\infty, 14]} \rightarrow [0, \sqrt{14}]$

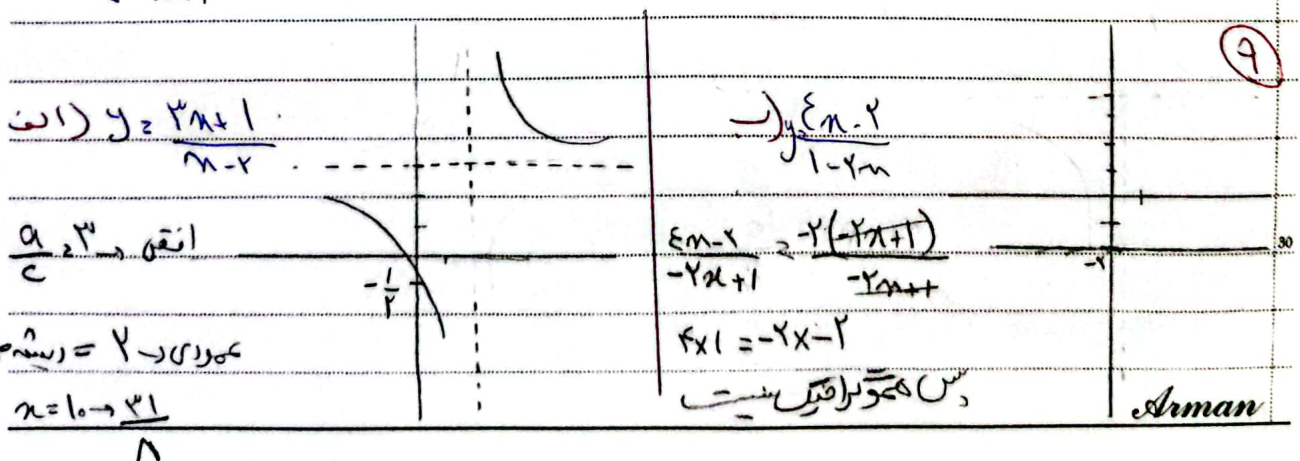
الف) $x^2 + 3x + 1 = 1R$ برترین توان محدود پس برد

ب) $y = \sqrt{x^2 + 4x + 1} = \sqrt{(-\infty, +\infty)} = [0, +\infty)$

الف) $\frac{3x+1}{x-2} \rightarrow \frac{3x+1}{x-2} = y \rightarrow \frac{-2y-1}{y-3} = x \quad R_f = 1R - \{3\}$

ب) $\frac{3}{1} = 3 \rightarrow 1R - \{3\} \quad \{1R - \{3\}\} = \{3\}$

ب) $\sqrt{\frac{4x+1}{x+3}} \rightarrow \sqrt{\frac{4}{1}} = \sqrt{4} \rightarrow +2 \rightarrow [0, +\infty) - \{2\}$



الف $\cos^2 x + \frac{1}{\cos^2 x} \rightarrow a + \frac{1}{a} \rightarrow$

$R_f = [2, +\infty)$

ب $y = \sqrt[3]{\frac{x^2+1}{x}} \rightarrow \sqrt[3]{x + \frac{1}{x}} \rightarrow R_f = (-\infty, \sqrt[3]{-2}] \cup [\sqrt[3]{2}, +\infty)$

چون x می تواند هر عددی باشد: $(هم \oplus هم \ominus)$ و هم منظور اسکال فرضه فرد است