

الف) $y = x^2 - 5 \Rightarrow -x^2 + 5 = -y \Rightarrow x^2 - 5 = y \Rightarrow x^2 = y + 5 \Rightarrow x = \pm \sqrt{y+5}$
 $R_f = [-5, +\infty)$ ✓

ب) $y = x^3 + 1 \Rightarrow -x^3 - 1 = -y \Rightarrow x^3 + 1 = y \Rightarrow x^3 = y - 1 \Rightarrow x = \sqrt[3]{y-1}$
 $R_f = \mathbb{R}$ ✓ (۲)

الف) $y = x^2 - 4x + 4 \Rightarrow x^2 - 4x + 4 - y = 0 \Rightarrow x^2 - 4x + (4-y) = 0$
 $\Rightarrow 16 - 4(1)(4-y) = 16 - 16 + 4y = 4y - 0 \Rightarrow 4y - 0 \geq 0 \Rightarrow y \geq 0 \Rightarrow R_f = [0, +\infty)$ ✓
 ب) $y = x^2 - 2x + 1 \Rightarrow x^2 - 2x + (1-y) = 0 \Rightarrow 4 - 4(1)(1-y) = 4 - 4 + 4y = 4y \geq 0 \Rightarrow y \geq 0 \Rightarrow R_f = [0, +\infty)$ ✓ (۲)

الف) $y = \frac{x^2+3}{x^2-2} \Rightarrow x^2y - 2y = x^2 + 3 \Rightarrow x^2y - x^2 = 2y + 3 \Rightarrow x^2(y-1) = 2y+3$
 $\Rightarrow x^2 = \frac{2y+3}{y-1} \Rightarrow x = \pm \sqrt{\frac{2y+3}{y-1}} \Rightarrow \frac{-\frac{3}{2}}{+\frac{1}{2}} \Rightarrow R_f = (-\infty, -\frac{3}{2}] \cup (1, +\infty)$ ✓
 ب) $y = \frac{2|x|+1}{|x|-2} \Rightarrow |x|y - 2y = 2|x|+1 \Rightarrow |x|y - 2|x| = 2y+1 \Rightarrow |x|(y-2) = 2y+1$
 $\Rightarrow |x| = \frac{2y+1}{y-2} \Rightarrow \frac{-\frac{1}{2}}{+\frac{1}{2}} \Rightarrow R_f = (-\infty, -\frac{1}{2}] \cup (2, +\infty)$ ✓ (۲)

$y = \frac{1}{x^2-4x} \Rightarrow 1 = y(x^2-4x) \Rightarrow yx^2 - 4yx - 1 = 0 \Rightarrow \Delta = 16y^2 - 4(y)(-1)$
 $\Rightarrow 16y^2 + 4y = 4y(4y+1) \Rightarrow \Delta \geq 0 \Rightarrow 4y(4y+1) \geq 0 \Rightarrow y(4y+1) \geq 0$
 $\Rightarrow \frac{-\frac{1}{4}}{+\frac{1}{4}} \Rightarrow R_f = (-\infty, -\frac{1}{4}] \cup (0, +\infty)$ ✓ (۲)

الف) $y = x^2 - 4x + 2 \Rightarrow \min \frac{b}{2a} = \frac{c}{a} = 2 \quad (2)^2 - 4(2) + 2 = -2$
 $|_{-2} \Rightarrow R_f = [-2, +\infty)$ ✓

ب) $y = -x^2 + 4x + 2 \Rightarrow \max \frac{b}{2a} = \frac{-c}{-a} = 2 \quad -(2)^2 + 4(2) + 2 = 6$
 $|_6 \Rightarrow R_f = (-\infty, 6]$ ✓ (۲)

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

ب) $y = \sqrt{-x^2 + 4x + 10} \Rightarrow \max \Rightarrow \frac{-b}{2a} = \frac{-4}{-2} = 2 \quad -(2)^2 + 4(2) + 10 = 14$
 $R_f = [0, \sqrt{14}]$ ✓

الف) $y = x^4 + 3x^2 + 2x + 1 \Rightarrow R_f = \mathbb{R}$ ✓

ب) $y = \sqrt{x^3 + 4x^2 + 4x + 1} \Rightarrow R_f = [0, +\infty)$ ✓

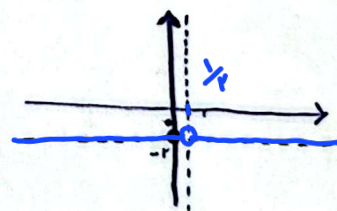
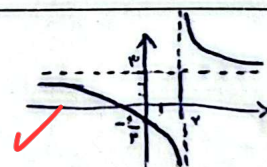
الف) $y = \frac{3x+1}{x-2} \Rightarrow R_f = \mathbb{R} - \{3\}$ ✓

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

الف) $y = \frac{3x+1}{x-2}$ جانب نام $\Rightarrow x=2$ ، جانب نام $\Rightarrow y=3$
 (نقطه کبی) $\Rightarrow \frac{1}{2}$

ب) $y = \frac{4x-2}{1-2x}$ جانب نام $\Rightarrow 1-2x=0 \Rightarrow -2x=-1 \Rightarrow x=\frac{1}{2}$
 جانب نام $\Rightarrow y=-2$

این تابع هم در کتب درسی
 هر ایلی به ما معرفی می ده.



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

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