

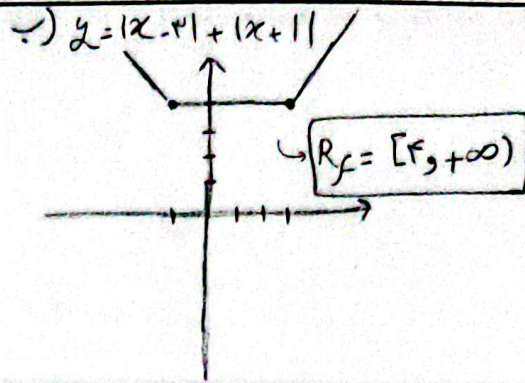
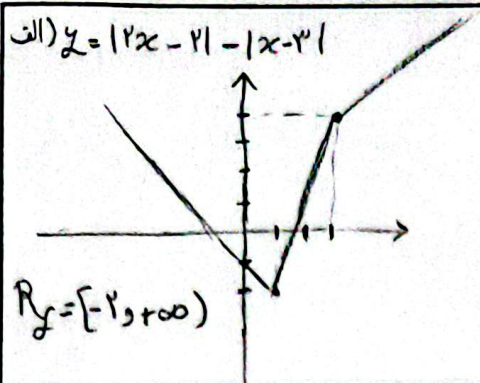
الف) $y = \frac{|x|+1}{|x|-2}$ $\frac{y}{x} \mid \begin{array}{c} -\frac{1}{2} \\ +1 \\ -1 \\ + \end{array}$ $\downarrow$ $2|x|-2y = |x|+1$
 $|x| = \frac{2y+1}{2-1}$
 باید از زیری باشد
 ب) $y = \frac{x^2+1}{|x|}$
 $x^2 - 2|x| + 1 = 0$
 $|x| = \frac{2 \pm \sqrt{4-4}}{2}$
 $R_f = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$
 $x^2 > 4 \Rightarrow \begin{cases} x > 2 \\ x < -2 \end{cases}$
 چون باید مثبت شود.
 $R_f = [2, +\infty)$

$y = \frac{x^2+2x-2}{x+3} \rightarrow x^2+2x-2 = y(x+3) \rightarrow x^2 + (2-y)x - 2-3y = 0$
 $x = \frac{2-y \pm \sqrt{(2-y)^2 - 4(-2-3y)}}{2}$
 $y^2 - 4y + 4 + 1 + 12y > 0$
 $y^2 + 8y + 5 > 0 \rightarrow (y+2)(y+4) > 0$
 $\downarrow \quad \downarrow$
 $-2 \quad -4$
 $\rightarrow R_f = (-\infty, -4] \cup [-2, +\infty)$

$y = \frac{x^2-x+\frac{1}{x}}{x^2-x+1}$ $2x^2-x+1 = x^2-x+\frac{1}{x} \rightarrow (x-1)x^2 + (-x+1)x + x - \frac{1}{x} = 0$
 $\Delta < 0 \rightarrow R_f = \mathbb{R}$
 $\rightarrow x = \frac{2-1 \pm \sqrt{(-2+1)^2 - 4(2-1)(2-\frac{1}{x})}}{2}$
 $-2y^2 + 12y > 0 \rightarrow y(-2y+12) > 0 \Rightarrow R_f = [0, 1]$

الف) $y = \sqrt{-x^2+4x-1}$
 $x_5 = \frac{-b}{2a} = \frac{-4}{-2} = 2$
 $\rightarrow y_5 = 3 \Rightarrow R_f = [0, \sqrt{3}]$
 ب) $y = \sqrt{2x^2-12x}$
 $\frac{-b}{2a} = \frac{6}{2} = 3 \rightarrow y_5 = -1 \Rightarrow R_f = [-1, +\infty)$

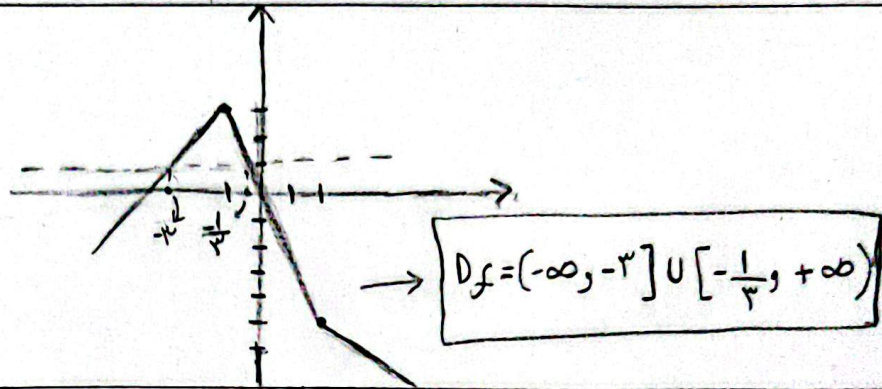
الف) $y = \log(x^2-x+1)$
 $R_f = (-\infty, +\infty)$
 ب) $y = \log\left(\frac{x^2+1}{x}\right)$ $x + \frac{1}{x} \geq 2$
 با توجه به میانگین
 $R_f = [\log 2, +\infty)$



$$|x - 2| - |2x + 2| \leq 1$$

$$x - 2 - 2x - 2 = -x - 4$$

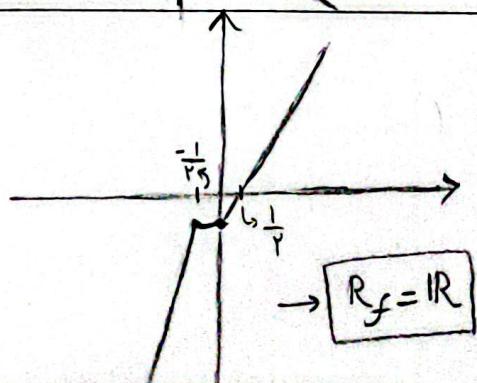
$$-x + 2 + 2x + 2 = x + 4$$



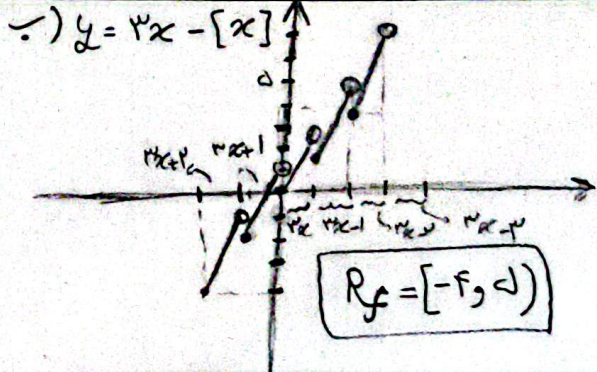
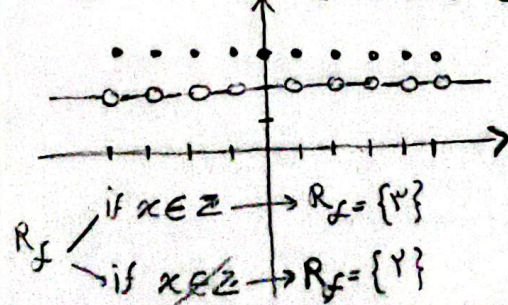
$$y = 3x - |2x + 1| + |x|$$

$$3x - x - 1 + x = 2x$$

$$3x + 2x + 1 - x = 4x + 1$$



الف) $y = [x] + [3 - x] = [x] + [-x] + 3$



الف) $y = \sin^2 x - \sin x + 1$

if $\sin x = 1 \rightarrow y = 1$

if $\sin x = -1 \rightarrow y = 3$

if $\sin x = \frac{1}{2} \rightarrow y = \frac{3}{4}$

$\rightarrow R_f = [\frac{3}{4}, 3]$

ب) $y = \sin^2 x + \sin^2 x + 1$

if $\sin^2 x = 1 \rightarrow y = 3$

if $\sin^2 x = 0 \rightarrow y = 1$

if $\sin^2 x = \frac{1}{4} \rightarrow y = \frac{5}{4}$

$\rightarrow R_f = [1, 3]$