محمد شیرازی

۱-
$f(-x) - xf(x) = 2|x|+1 \xrightarrow{x \to -x} -xf(-x) + x^2 f(x) = -2x|x| - x$

$f(x) + xf(-x) = 2|x| + 1$

$\Big\} f(x)(1+x^2) = -2x|x| - x + 2|x| + 1 \Rightarrow f(x) = \frac{(1-x)(2|x|+1)}{x^2+1}$

۲-
$x=0 \to 2f(0) = 6 \to f(0) = 3 \to f(x) = x^2 - 2x + 3 \to f(x^2) = x^4 - 2x^2 + 3$

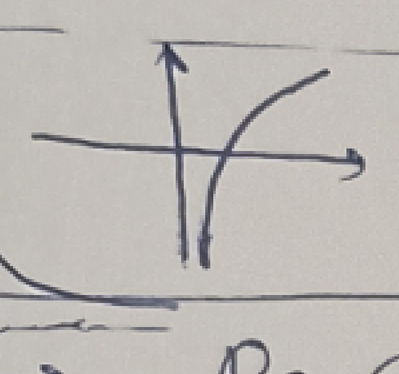
۳-
$\frac{(x+2)(x-1)}{x-1} = x+2 = y \to x = y-2 \xrightarrow{x \neq 1} y-2 \neq 1 \to \boxed{y \neq 3} \to R_f = \mathbb{R} - \{3\}$

۴- الف) $\frac{-b}{2a} = \frac{5}{4} \to f(\frac{5}{4}) = \frac{-17}{8} \to R_f = [\frac{-17}{8}, +\infty)$

ب) $\frac{-b}{2a} = \frac{-6}{-2} = 3 \to f(3) = 4 \to R_f = [2, 5]$

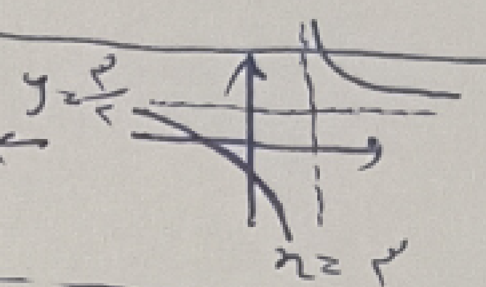
ج) چون بزرگترین توان فرد است $\Leftarrow$ $R_f = [0, +\infty)$

د) شکل،



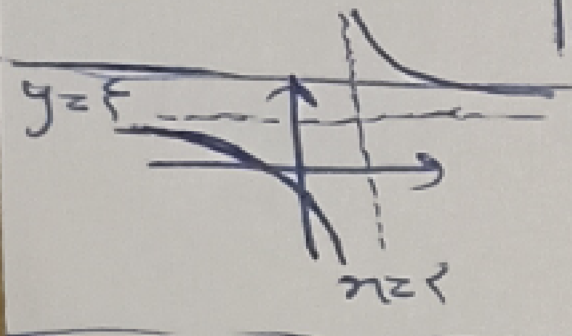
$R_f = \mathbb{R}$

۵- الف) شکل:



$R_f = \mathbb{R} - \{\frac{3}{2}\}$

ب) رسم شکل:



$R_f = [0, +\infty) - \{2\}$

ج) $\frac{x^2+2+1}{\sqrt{x^2+2}} = \sqrt{x^2+2} + \frac{1}{\sqrt{x^2+2}} \xrightarrow{\sqrt{x^2+2} \geq 0} R_f = [2, +\infty)$

د) $x=0 \to \boxed{y = \frac{1}{4}} \to R_f = [\frac{1}{4}, +\infty)$ [illegible]

۶- تذکر ۲:

$x \to \infty \to y = 3$

$x = 0 \to y = -4$

مخرج صفر نشود $\Rightarrow$ $R_f =$ [illegible] $(3, +\infty) \cup (-\infty, -4]$

روش اصلی

$x^2 = \frac{y+4}{y-3} \geq 0$

	-4		3	
$+$	0	$-$	‡	$+$

مخرج

مخرج

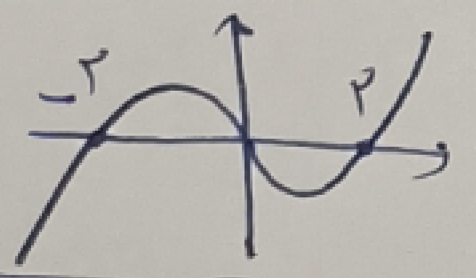
۷-
$\sin x = 1 \to y = -2$

$\sin x = -1 \to y = -0.5$

$\Big\}$ مخرج صفر نمی‌شود $\to \boxed{-2 \leq y \leq -0.5}$

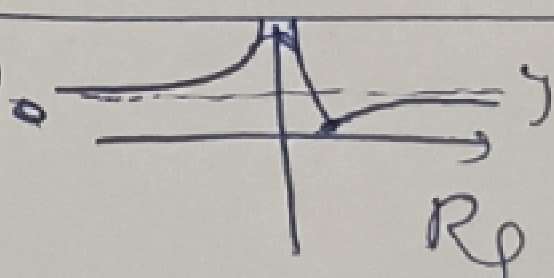
۹-
$x \geq 0 \to x^2 - 2x$

$x < 0 \to -x^2 - 2x$



$R_f = \mathbb{R}$

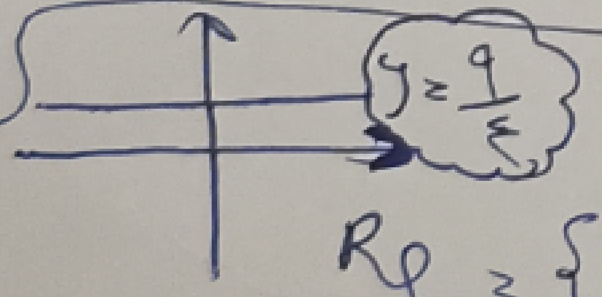
۸- الف) رسم،



y_0

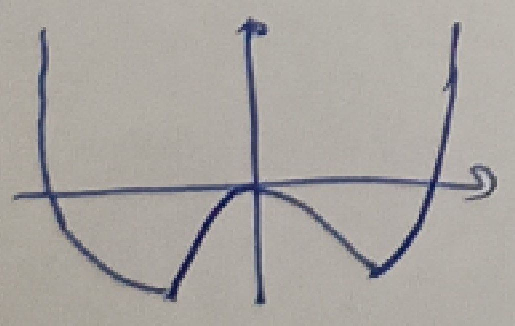
$R_f = [0, +\infty)$

ب) رسم،

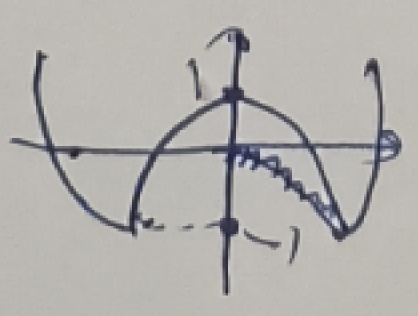


$R_f = \{\frac{3}{2}\}$

۱۰-
$f(|x|)$



$\to f(|x|)+1$



$\to |f(|x|)+1|$