

الف)  $y = x^3 - 3x^2 + 3x$

$\rightarrow IR$   
 $R_f$

$(-\infty, -1] \cup (0, +\infty)$   
 $y = \frac{x^2 - 2x}{x^2 - 2x}$   
 $y(x^2) - 2xy = 1$   
 $2(x^2) - 2xy - 1 = 0 \rightarrow (2y)^2 - 4xy - 1 = 0$

الف)  $y = x^2 - 4x + 6$

$\rightarrow C - \frac{b^2}{4a} \rightarrow 6 - \frac{16}{4} \rightarrow 2$   
 $a > 0 \rightarrow \min$   
 $[4, +\infty)$   
 $R_f$

ب)  $y = -x^2 + 4x + 3$

$C - \frac{b^2}{4a} \rightarrow 3 - \frac{16}{-4} \rightarrow 11$   
 $a < 0 \rightarrow \max$   
 $(-\infty, 11]$   
 $R_f$

ج)  $y = \sqrt{x^2 - 4x - 3}$   $R_f = [0, +\infty)$

$C - \frac{b^2}{4a} \rightarrow -2 - \frac{16}{4} \rightarrow -7$   
 $a > 0 \rightarrow \min$   
 $[-7, +\infty)$

د)  $y = \sqrt{4x - x^2}$

$\frac{C - \frac{b^2}{4a}}{4a} \rightarrow \frac{-2 - \frac{16}{4}}{-4} \rightarrow 1$   
 $a < 0 \rightarrow \max$   
 $(-\infty, 1]$   
 $[0, 3]$   
 $R_f$

الف)  $y = 2x - 5x^2 + 2x + 1$

$R_f = IR$

ب)  $y = x^5 - 4x^4 + 3x + 1$

$R_f = IR$

ج)  $y = \sqrt{x^5 - 4x^4 + 5x + 1}$

$R_f = [0, +\infty)$

د)  $y = (x^5 - 4x^4 + 3x + 1)^2$

$R_f = [0, +\infty)$

الف)  $y = \frac{3x+1}{x-2}$

$R_f = IR - \{2\}$

ب)  $y = \frac{2x+1}{x+1}$

$R_f = IR - \{1\}$

الف)  $y = \sqrt{\frac{2x+1}{x+1}}$

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

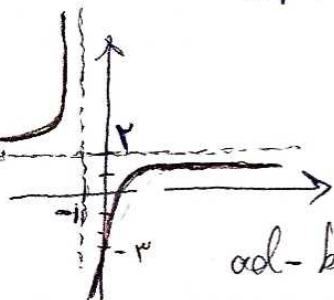
ب)  $y = \sqrt{\frac{3x+1}{2-x}}$

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

$\frac{3x+1}{2-x} \geq 0$   
 $\frac{3x+1}{2-x} \geq 0$   
 $\frac{3x+1}{2-x} \geq 0$

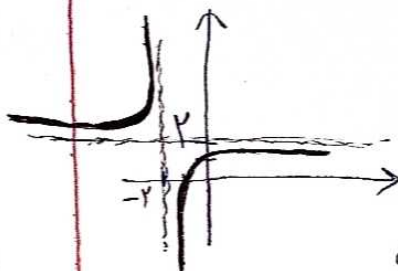
$\rightarrow x \geq \frac{1}{3} \rightarrow \frac{1}{3}$   
 $\rightarrow x < 2 \rightarrow 2$

$$\text{الف) } y = \frac{2x-3}{x+1}$$



ad-be < 0 → 8x < 0

$$\text{ب) } y = \frac{2x-1}{x+2}$$



ad-be < 0 → 8x < 0

$$\text{الف) } y = \sin x + \frac{1}{\sin x}$$

$$R_f = (-\infty, -2] \cup [2, +\infty)$$

$$\text{ب) } y = \frac{x^4+1}{x^3}$$

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

$$\text{ج) } y = \frac{\sqrt[3]{x^2+1}}{\sqrt[3]{x}}$$

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

$$\text{د) } y = \sqrt{x} + \frac{1}{\sqrt{x}}$$

$$a = \frac{1}{a} \geq 2$$

$$R_f = [1, +\infty)$$

$$\text{الف) } y = x^2 + \frac{1}{x^2+3} - 3$$

$$x^2 \geq 0$$

$$\hookrightarrow x^2+3 \geq 3$$

$$R_f = \left[\frac{1}{3}, +\infty\right)$$

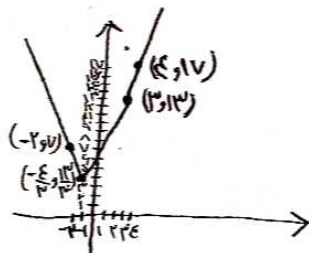
$$\text{ب) } y = \frac{x^2+5}{\sqrt{x^2+4}}$$

$$\frac{x^2+4}{\sqrt{x^2+4}} + \frac{1}{\sqrt{x^2+4}}$$

$$R_f = [1, +\infty)$$

$$y = |x-3| + |3x+5|$$

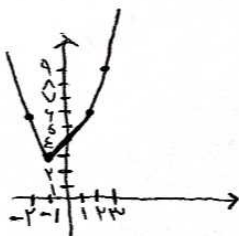
|                      |                  |                  |                  |
|----------------------|------------------|------------------|------------------|
|                      | $-\frac{5}{3}$   | 3                |                  |
| $y =  x-3  +  3x+5 $ | $ x+3  +  3x+5 $ | $ x-3  +  3x+5 $ | $ x-3  +  3x+5 $ |
| $-5x-1$              | $2x+8$           | $4x+2$           | $4x+2$           |



$$R_f = \left[\frac{4}{3}, +\infty\right)$$

$$\text{الف) } y = |x^2| + |2x+1|$$

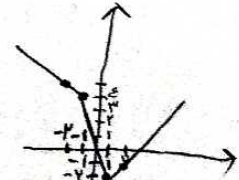
|                      |                  |                  |                  |
|----------------------|------------------|------------------|------------------|
|                      | -1               | 0                |                  |
| $y =  x^2  +  2x+1 $ | $ x^2  +  2x+1 $ | $ x^2  +  2x+1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



$$R_f = [0, +\infty)$$

$$\text{ب) } y = |x^2-1| - |x+1|$$

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



$$R_f = [-1, +\infty)$$