

Ergebnisse

a) $y = \frac{|x|+1}{|x|-r}$

(1)

$$y' = \frac{x+1}{x-r} \rightarrow Ry = \{R - \frac{1}{r}\} \rightarrow \frac{|x|+1}{|x|-r} \rightarrow y \rightarrow Ry = \{R - \frac{1}{r}\}$$

b) $y = \frac{x^r+1}{|x|} \rightarrow \frac{|x|^r+1}{|x|} \rightarrow |x| + \frac{1}{|x|}$

$$\frac{|x|+1}{a} \rightarrow a + \frac{1}{a} \xrightarrow{a>0} Ry = [r, +\infty)$$

$y = \frac{x^r+rx-r}{x+r} = \frac{(x+r)(x-1)+1}{x+r} = x-1 + \frac{1}{x+r} \rightarrow *$

(P)

$$x^r+rx-r-1+1 = x^r+rx-r+1 = (x+r)(x-1)+1$$

* Lösung: $x-1 + \frac{1}{x+r} + r - r = x+r + \frac{1}{\frac{x+r}{a}} - r$

min a $\Rightarrow x = -r \Rightarrow a + \frac{1}{a} = +r$
 $a = -r+r = +1$

$\left. \begin{array}{l} \rightarrow x = -r \Rightarrow a = -r+r = -1 \Rightarrow a + \frac{1}{a} = -r \end{array} \right\} -r$

$Ry = (-\infty, -r] \cup [-r, +\infty)$

f(x) $= \frac{x^r-x+\frac{1}{r}}{x^r-x+\frac{1}{r}+\frac{r}{r}} = \frac{\frac{a}{(x-\frac{1}{r})^r}}{\frac{(x-\frac{1}{r})^r+\frac{r}{r}}{x^r-x+\frac{1}{r}+\frac{r}{r}}} \rightarrow +\infty$

(P)

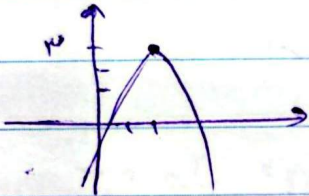
$D_{f(x)} \Rightarrow (x-\frac{1}{r})^r + \frac{r}{r} = 0 \rightarrow (x-\frac{1}{r})^r = -\frac{r}{r} \in \mathbb{R} \quad D_f = \mathbb{R}$

Spiegelung

$$(x - \frac{1}{r})^r = a \rightarrow f(x) = \frac{a}{a + \frac{x}{r}} \rightarrow R_f = \mathbb{R} - \{1\}$$

ii) $y = \sqrt{-x^2 + 4x - 1} \in \sqrt{-(x-2)^2 + 3} \Rightarrow \sqrt{(-\infty, 3]} = [0, 2] \text{ (F)}$

$$y = -x^2 + 4x - 1 = -x^2 + 4x - 4 + 3 = -(x-2)^2 + 3$$



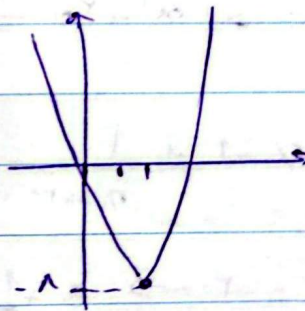
$$\leftarrow f(x) = -(x-2)^2 + 3$$

$$R_{f(x)} = (-\infty, 3]$$

iii) $y = \sqrt{4x^2 - 4x} = \sqrt{4x(x-1)} \Rightarrow R_y = [-1, +\infty)$

$$f(x) = 4x^2 - 4x$$

ext / $\frac{-b}{2a} = \frac{+1}{2} = \frac{1}{2}$



$$R_{f(x)} = [-1, +\infty)$$

iv) $\log(x^2 - x + 1)$

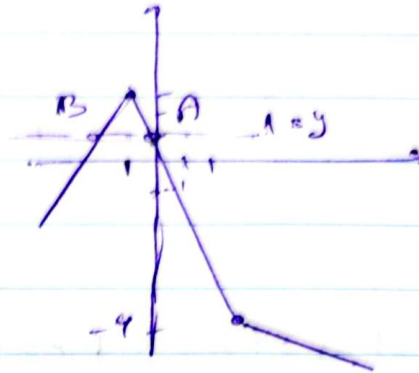
$$0 < x^2 - x + 1 \rightsquigarrow R_{f(x)} = \mathbb{R}$$

(a)

تجزیه

$$|x-1| - |2x+1| < 1 \quad (v)$$

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



$$\begin{array}{c|c|c} -1 & & 1 \\ \hline x+2 & 1-x-2x-1 & x-1-2x-1 \\ \hline & -3x & -x-2 \\ \hline & \downarrow & \downarrow \\ & -1 & -2 \\ & | & | \\ & -1 & -2 \end{array}$$

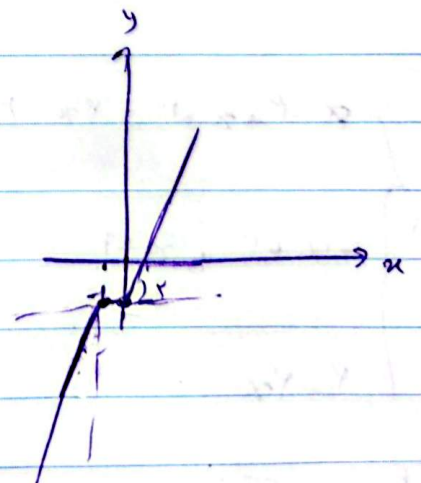
$$A \rightarrow \begin{cases} x_A \rightarrow y=1 \\ f = -2x \end{cases} \rightarrow 1 = -2x \rightarrow x_A = -\frac{1}{2} \quad A \text{ ریشه}$$

$$x_B \rightarrow \begin{cases} y=1 \\ y = x+2 \end{cases} \rightarrow 1 = x+2 \rightarrow x = -1 \quad B$$

$$(-\infty, -1] \cup [-\frac{1}{2}, +\infty) : -1$$

$$y = 2x - |2x+1| + |x-1| \quad (1)$$

$$\begin{array}{c|c|c} -\frac{1}{2} & & 1 \\ \hline 2x+2x+1-x & 2x-2x-1-x & 2x-2x-1+x \\ \hline 2x+1 & -1 & x-1 \\ \hline & \downarrow & \downarrow \\ & -\frac{1}{2} & 0 \\ & | & | \\ & -1 & 1 \end{array}$$



$$R_y = \mathbb{R}$$

مسائل

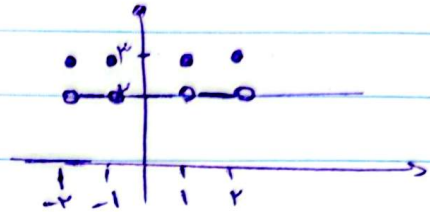
الف) $y = \{n\} + \{r-n\}$

$D_y = [-r, r]$ (9)

$y = \{n\} + \{-n\} + r$

$\{n\} + \{-n\} = 0 \quad \leftarrow n \in \mathbb{Z} \rightarrow$

$\{n\} + \{-n\} = -1 \quad n \notin \mathbb{Z}$



$R_y = \{r, r\}$

ب) $y = rx - \{n\}$

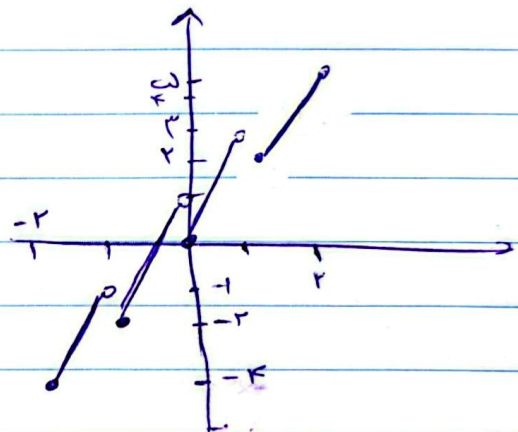
$y = rx - r \quad x = r \rightarrow y = r$

$y = rx - 1 \quad 1 \leq x < r$

$y = rx \quad 0 \leq x \leq 1$

$y = rx + 1 \quad -1 \leq x < 0$

$y = rx + r \quad -r \leq x < -1$



$R_y = [-r, r]$

ج) $y = \sin^r x - \sin x + 1 \rightarrow \min \boxed{\sin = -1} \rightarrow y = r$ (10)

$R_f = [\frac{r}{r}, +\infty)$

$\rightarrow \max \boxed{\sin = 1} \rightarrow y = 1$

$\rightarrow \frac{-b}{ra} = +\frac{1}{r} \rightarrow \frac{1}{r} - \frac{1}{r} + 1 = -\frac{1}{r} + 1 = \frac{r}{r}$

د) $y = \sin^r x + \sin^r x + 1 \rightarrow \sin^r x = t \rightarrow \min t = 0$

$\rightarrow \max t = 1$

$R_y = [1, +\infty)$

$\rightarrow \frac{-b}{ra} = \frac{1}{r} = \frac{1}{r} \in \mathbb{R}$