

$$f(-n) - n f(n) = 2|n| + 1 \xrightarrow{n \geq 0} f(-n) - n f(n) = 2n + 1$$

$$\xrightarrow{n < 0} f(-n) - n f(n) = 2|-n| + 1 \xrightarrow{x=n}$$

$$f(-n) - n f(n) = 2n + 1$$

$$n f(-n) - n^2 f(n) = 2n^2 + n$$

$$\frac{f(-n) - n^2 f(n)}{f(-n)(1+n^2)} = \frac{2n^2 + n + 1}{1+n^2} \Rightarrow f(-n) = \frac{2n^2 + n + 1}{1+n^2} \Rightarrow$$

$$f(n) = \frac{2n^2 - n + 1}{1+n^2}$$

$$f(n) + f(0) = n^2 - 2n + 4 \xrightarrow{n=0} f(0) + f(0) = 4 \rightarrow f(0) = 2 \Rightarrow f(n) = n^2 - 2n + 4$$

$$\Rightarrow f(n) = n^2 - 2n + 4$$

$$y = \frac{n^2 + n + 1}{n-1} \rightarrow y_n - y = n^2 + n + 1 \Rightarrow n^2 + n(1-y) + y + 1 = 0 \rightarrow$$

$$\Delta = (1-y)^2 - 4(1)(y+1) = y^2 - 2y + 1 - 4y - 4 = y^2 - 6y - 3 \geq 0$$

$$n_1, n_2 = \frac{-1+y \pm \sqrt{y^2 - 6y - 3}}{1}$$

$$(y-3)(y+1) \geq 0 \quad \frac{-1}{+} \frac{3}{-}$$

$$R_f = (-\infty, -1] \cup [3, +\infty)$$

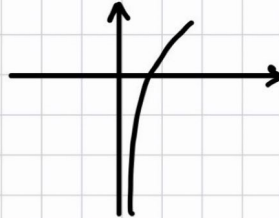
$$f(x) = \frac{2x^2 - 2x + 1}{x^2 + 1} \quad \text{ent} \left| \frac{-b}{2a} \right| = \left| \frac{1}{1} \right| = 1 \Rightarrow R_f = [-1, +\infty)$$

$$2\left(\frac{1}{2}\right)^2 - 2\left(\frac{1}{2}\right) + 1 = -\frac{1}{2}$$

$$y = \sqrt{n^2 + 4n - 4} \rightarrow \text{ent} \left| \frac{1}{2} \right| \rightarrow \sqrt{(-\infty, 4]} = R_f = [0, 4]$$

$$y = \sqrt{n^2 - 2n + 1} \rightarrow \sqrt{(-\infty, +\infty)} = [0, +\infty)$$

د) $\log(x^3 - 4x^2 + 7x + K) \rightarrow R_f = \mathbb{R}$



الف) $y = \frac{Kx+1}{x^2-4} \xrightarrow[\text{تابع كسري}]{R_f = \mathbb{R} \setminus \{-\frac{1}{K}\}} R_f = \mathbb{R} \setminus \{-\frac{1}{K}\}$

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ب) $y = \sqrt{\frac{Kx+1}{x-2}} \rightarrow \sqrt{\mathbb{R} \setminus \{-\frac{1}{K}\}} = [0, +\infty) \setminus \{-\frac{1}{K}\}$

ج) $y = \frac{x^2+K}{\sqrt{x^2+K}} = \frac{x^2+K+1}{\sqrt{x^2+K}} = \sqrt{x^2+K} + \frac{1}{\sqrt{x^2+K}} \xrightarrow[\text{مقدارين متساويين}]{\sqrt{x^2+K} = \frac{1}{\sqrt{x^2+K}}} = \sqrt{x^2+K} + \frac{1}{\sqrt{x^2+K}} \Rightarrow R_f = [\sqrt{K} + \frac{1}{\sqrt{K}}, +\infty)$

$[\frac{K\sqrt{K}}{K}, +\infty)$

د) $y = x^2 + \frac{1}{x^2+K} \rightarrow +K, -K \rightarrow x^2+K + \frac{1}{x^2+K} \xrightarrow[\text{مقدارين متساويين}]{\frac{1}{x^2+K} = \frac{1}{x^2+K}} \frac{1}{x^2+K} - K = \frac{1}{x^2+K} \rightarrow R_f = [\frac{1}{K}, +\infty)$

$y = \frac{Kx^2+K}{x^2-1} \xrightarrow[\text{دروس اقل}]{x^2 = -\frac{y+K}{y-K}} = \frac{y+K}{y-K} \rightarrow x = \pm \sqrt{\frac{y+K}{y-K}} \quad + \frac{-K}{1} - \frac{K}{1} +$

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$R_f = (-\infty, -K] \cup (K, +\infty)$ $y x^2 - y = Kx^2 + K \rightarrow x^2(y-K) = K + y \rightarrow x^2 = \frac{y+K}{y-K}$

دروس درج

$x=0 \rightarrow y = \frac{K}{-1} = -K$

$x=+\infty \rightarrow y = \frac{K(+\infty)}{1(+\infty)} = K \rightarrow (-\infty, -K] \cup (K, +\infty)$

$\sin x \rightarrow -1, 1$

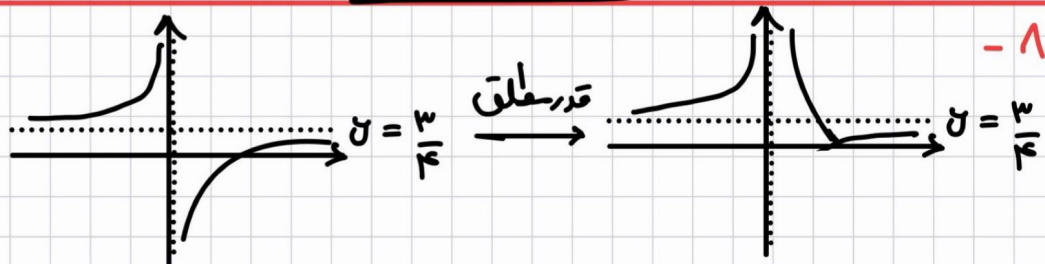
$\sin x = 1 \rightarrow y = \frac{K(1)+K}{1-K} = \frac{2K}{1-K} = -K$

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$\sin x = -1 \rightarrow y = \frac{K(-1)+K}{-1-K} = \frac{0}{-1-K} = -\frac{1}{K}$

$\Rightarrow R_f = [-K, -\frac{1}{K}]$

الف) $y = \left| \frac{Kx-1}{K} \right|$



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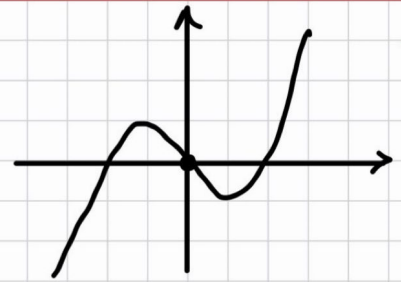
$R_f = [0, +\infty)$

$$ج) y = \sqrt{\frac{9n-18}{4n-18}} = \sqrt{\frac{9(n-2)}{4(n-2)}} = \sqrt{\frac{9}{4}} = \frac{3}{2} \rightarrow R_f = \left\{ \frac{3}{2} \right\}$$

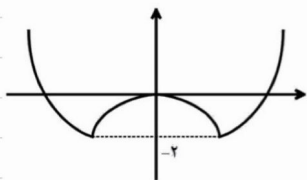
$$y = n|n| - 2n$$

$$f(n) \begin{cases} n^2 - 2n & n \geq 0 \\ -n^2 - 2n & n < 0 \end{cases}$$

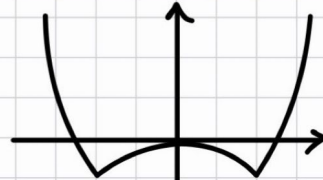
$$R_f = \mathbb{R}$$



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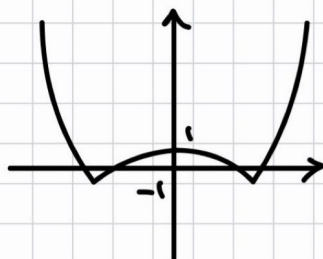


$$|f(n)| + 1 \rightarrow f(n)$$

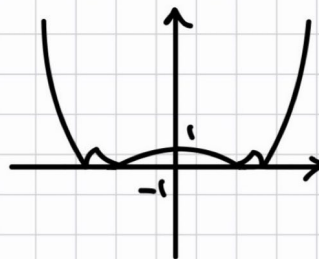


$$f(n) + 1$$

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$$|f(n)| + 1$$



تمام تلاشم رو کردم شکل حائز
در بیا ر یعنی که آه خوب نشده ☹️