

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

(۲) (۱)

$$f(n) + n f(-n) = 2|n| + 1 \quad (2)$$

$$\text{از هم کم کنیم} \rightarrow -(n^2+1)f(n) = (n-1)(2|n|+1) \rightarrow \boxed{f(n) = \frac{(1-n)(2|n|+1)}{n^2+1}}$$

$$f(n) + f(0) = n^2 - 3n + 4 \xrightarrow{n=0} 2f(0) = 4 \rightarrow f(0) = 2$$

(۲) (۲)

$$\rightarrow f(n) = n^2 - 3n + 3 \quad \text{برای } n^2 \text{ و } n \text{ صوری} \rightarrow \boxed{f(n^2) = n^4 - 3n^2 + 3}$$

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

(۲) (۳)

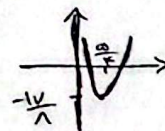
$$\Delta = (1-y)^2 - 4(2+y) = y^2 - 4y - 7$$

$$\Delta \geq 0 \rightarrow y^2 - 4y - 7 \geq 0 \quad \frac{-1}{+} \frac{4}{-} \frac{7}{+} \rightarrow \boxed{R_f = [4R - (-1, 7)]}$$

$$\text{الف) } y = 2n^2 - 5n + 1$$

$$\min \left| -\frac{b}{2a} = \frac{5}{4} \right|$$

$$2\left(\frac{5}{4}\right)^2 - 5\left(\frac{5}{4}\right) + 1 = -\frac{17}{8}$$



$$\boxed{R_f = [-\frac{17}{8}, +\infty)}$$

(۲) (۴)

$$\text{ب) } y = \sqrt{-n^2 + 4n} - 5$$

$$\max \left| -\frac{b}{2a} = 2 \right|$$

$$\rightarrow \sqrt{(-\infty, 4]} \rightarrow \boxed{R_f = [0, 2]}$$

$$\text{ج) } y = \sqrt{n^4 - 2n^2 + 4n + 1}$$

$$\text{بر عبارت زیر رادیکال برابر ۱ است} \rightarrow \sqrt{1R} \rightarrow \boxed{R_f = [0, +\infty)}$$

$$\text{د) } y = \log(n^2 - 4n^2 + 4n + 4) \quad \text{بر عبارت زیر لگاریتم برابر ۱ است} \rightarrow \log(1R) \rightarrow \boxed{R_f = 1R}$$

$$\text{الف) } y = \frac{3n+1}{3n-4}$$

$$\rightarrow R_f = 1R - \left\{ \frac{4}{3} \right\} \rightarrow \boxed{R_f = 1R - \left\{ \frac{4}{3} \right\}}$$

(۲) (۵)

$$\text{ب) } y = \sqrt{\frac{4n+1}{n-2}}$$

$$\text{بر عبارت زیر رادیکال} = 1R - \{2\} \rightarrow R_f = \sqrt{1R - \{2\}} \rightarrow \boxed{R_f = [0, +\infty) - \{2\}}$$

$$\text{ج) } y = \frac{n^2+4}{\sqrt{n^2+3}} = \frac{n^2+3+1}{\sqrt{n^2+3}} = \frac{\sqrt{n^2+3}}{1} + \frac{1}{\sqrt{n^2+3}}$$

$$\text{کمترین مقدار } a \text{ برای } n=0 \rightarrow \sqrt{3} \rightarrow \boxed{R_f = \left[\sqrt{3} + \frac{1}{\sqrt{3}}, +\infty \right)}$$

$$\text{د) } y = n^2 + \frac{1}{n^2+4} + 4 - 4 = \frac{(n^2+4) + \frac{1}{(n^2+4)}}{[4 + \frac{1}{4}, +\infty)} - 4 \rightarrow \boxed{R_f = \left[\frac{1}{4}, +\infty \right)}$$

$$y = \frac{3n^2+4}{n^2-1}$$

$$\text{مجموعه } U: \frac{3n^2+4}{n^2-1} = y \rightarrow n^2 = -\frac{y-4}{y-3} \rightarrow \frac{n^2}{y-3} = \frac{y-4}{y-3}$$

(۲) (۶)

$$\frac{y-4}{y-3} \geq 0 \quad \frac{-4}{+} \frac{3}{-} \rightarrow \boxed{R_f = 1R - (-4, 3]}$$

$$\text{نکته: } n^2=0 \rightarrow y = \frac{4}{-1} = -4$$

$$n^2=+\infty \rightarrow y = 3$$

چون بیغ منفی می شود

$$\boxed{R_f = (-\infty, -4] \cup (3, +\infty)}$$

$$f(m) = \frac{2 \sin m + 4}{\sin m - 2}$$

نکته: ⑤

$$\sin m = 1 \rightarrow f(m) = \frac{6}{-1} = -6$$

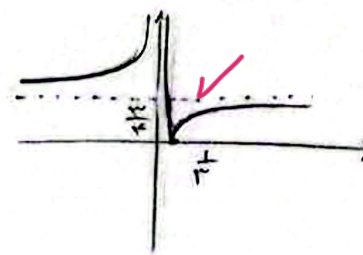
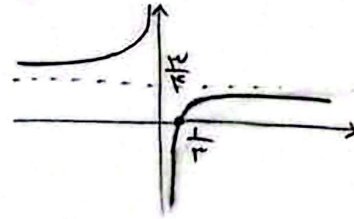
$$\sin m = -1 \rightarrow f(m) = \frac{2}{-3} = -\frac{2}{3}$$

چون مخرج صفر نمی شود

$$R_f = [-6, -\frac{2}{3}]$$

(۲) (۷)

الف) $y = \left| \frac{3m-1}{m} \right|$

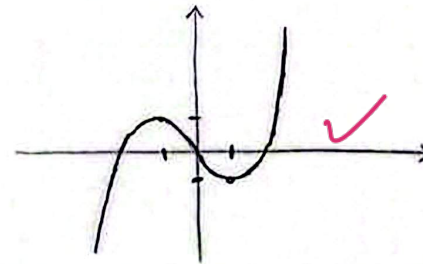


$$R_f = [0, +\infty)$$

(۲) (۸)

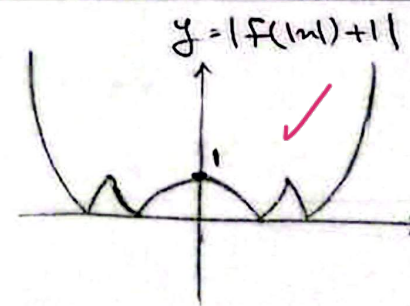
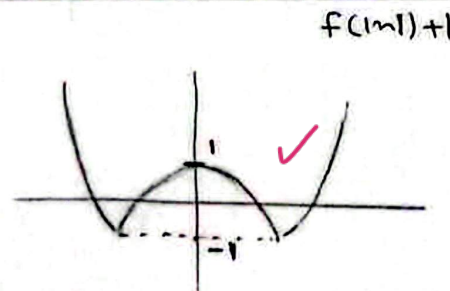
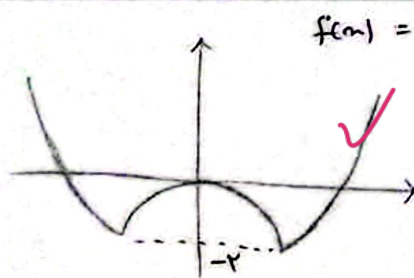
ب) $y = \sqrt{\frac{9m-11}{m-1}} = \sqrt{\frac{\frac{9}{m}(m-1)}{(m-1)}} = \sqrt{\frac{9}{m}} = \frac{3}{\sqrt{m}} \rightarrow R_f = \left\{ \frac{3}{\sqrt{m}} \right\}$

$$y = x|x| - 2x \rightarrow y = \begin{cases} x^2 - 2x & ; x \geq 0 \\ -x^2 - 2x & ; x \leq 0 \end{cases}$$



$$R_f = \mathbb{R}$$

(۲) (۹)



(۲) (۱۰)