

(1)

$$f(m) = ? \rightarrow f(-m) - mf(m) = \nu|m| + 1$$

$$\rightarrow m = m \rightarrow f(-m) - mf(m) = \nu|m| + 1$$

$$\rightarrow m = -m \rightarrow f(m) + mf(-m) = \nu|m| + 1$$

$$\rightarrow \begin{cases} -mf(-m) + mf(m) = -\nu|m| + 1 \\ f(m) + mf(-m) = \nu|m| + 1 \end{cases} \rightarrow \begin{cases} mf(m) + f(m) = \nu|m| + 1 - \nu|m| + 1 \\ f(m) + mf(-m) = \nu|m| + 1 \end{cases}$$

$$\rightarrow f(m) = \frac{\nu|m| + 1 - \nu|m| + 1 - m}{m^2 + 1} \rightarrow f(m) = \frac{(1-m)(\nu|m| + 1)}{m^2 + 1}$$

(2)

$$f(m) + f(0) = m^2 - 2m + 4 \rightarrow m = 0 \rightarrow f(0) = 4 \rightarrow f(0) = \nu$$

$$\rightarrow f(m) = m^2 - 2m + 4 \rightarrow f(m^2) = m^4 - 2m^2 + 4$$

(3)

$$y = \frac{a^2 m + r}{a - 1} \rightarrow y_m - y = \frac{a^2 m + r}{a - 1} \rightarrow a^2 y_m + a + r + y = 0$$

$$\rightarrow m^2 + ((1-y)/m + r)y = 0 \rightarrow a = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow a = \frac{y-1 \pm \sqrt{(1-y)^2 - 4(r+y)}}{2}$$

$$\rightarrow (1-y)^2 - 4(r+y) > 0 \rightarrow y^2 - 4y - \nu > 0 \rightarrow R_F = (-\infty, -1) \cup (\nu + \infty)$$

(4)

$$\text{الف) } y = m^2 - 2m + 1 \rightarrow m = -\frac{b}{2a} \rightarrow a = \frac{d}{f} \quad y = -\frac{1}{\lambda}$$

$$\rightarrow R_F = [-\frac{1}{\lambda}, +\infty)$$

$$\text{ب) } y = \sqrt{-m^2 - 4m - 3} \rightarrow a = -\frac{b}{2a} \rightarrow a = 0 \rightarrow y = 0 \rightarrow R = (-\infty, 0]$$

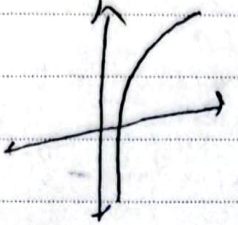
$$\rightarrow R_F = [R \rightarrow [0, 1]]$$

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۹) $y = \sqrt{u^2 - \varepsilon u^2 + \varepsilon u + 1} \rightarrow$ ادا می نشانی که با توجه به اینکه بیشترین فاصله فراتر است

بنابر این داریم

۸ $\rightarrow R = IR \rightarrow R_F = \sqrt{R} \rightarrow [0, +\infty) = R_F$

۹ $y = \sqrt{u^2 - \varepsilon u^2 + \varepsilon u + 1} \rightarrow$  $\rightarrow R_F = (-\infty, +\infty)$

۱۰ الف) $y = \frac{u^2 + 1}{u - \varepsilon} \rightarrow y u - \varepsilon y = u^2 + 1 \rightarrow y u - u^2 = 1 + \varepsilon y$

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۱۱ $\rightarrow u(y - \varepsilon) = 1 + \varepsilon y \rightarrow u = \frac{1 + \varepsilon y}{y - \varepsilon} \rightarrow R_F = \left\{ \frac{u}{\varepsilon} \right\}$

۱۲ ب) $y = \sqrt{\frac{\varepsilon u + 1}{u - \varepsilon}} \rightarrow y^2 \geq 0 \rightarrow y^2 = \frac{\varepsilon u + 1}{u - \varepsilon} \rightarrow y^2 u - \varepsilon y^2 = \varepsilon u + 1$

$\rightarrow y^2 u - \varepsilon u = 1 + \varepsilon y^2 \rightarrow u(y^2 - \varepsilon) = 1 + \varepsilon y^2 \rightarrow u = \frac{1 + \varepsilon y^2}{y^2 - \varepsilon}$

۱۳ $\rightarrow R_F = [0, 1) \cup (1, +\infty)$

۱۴ ۹) $y = \frac{u^2 + \varepsilon}{\sqrt{u^2 + \varepsilon}} \rightarrow \frac{u^2 + \varepsilon + 1}{\sqrt{u^2 + \varepsilon}} \rightarrow \sqrt{u^2 + \varepsilon} + \frac{1}{\sqrt{u^2 + \varepsilon}} \rightarrow u \leq 0$

$\rightarrow y = \frac{\varepsilon}{\sqrt{\varepsilon}} \rightarrow R_F = \left(\frac{\varepsilon}{\sqrt{\varepsilon}}, +\infty \right)$

۱۵ ۱) $y = u^2 + \frac{1}{u^2 + \varepsilon} \rightarrow u^2 + \varepsilon + \frac{1}{u^2 + \varepsilon} - \varepsilon \rightarrow u^2 \geq 0 \rightarrow y = \frac{1}{\varepsilon}$

$\rightarrow R_F = \left[\frac{1}{\varepsilon}, +\infty \right)$

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

$$\rightarrow a = -b \pm \sqrt{b^2 - 4ac} \rightarrow m = \frac{-(-y+1) \pm \sqrt{(-y+1)^2 - 4(-1)(-y-\varepsilon)}}{2(-1)} \rightarrow R_F = [R - \frac{\varepsilon}{2}, R]$$

$$y = \frac{m^2 + \varepsilon}{m^2 - 1} \rightarrow m^2 = \infty \rightarrow y = 1 \rightarrow m^2 = 0 \rightarrow y = -\varepsilon$$

$$\rightarrow R_F = [R - \varepsilon, R]$$

$$f(m) = \frac{m \sin m + \varepsilon}{\sin m - 1} \rightarrow \sin m = 1 \rightarrow y = -\frac{1}{\varepsilon}$$

$$\sin m = 0 \rightarrow y = -\frac{\varepsilon}{2} \quad \sin m = 1 \rightarrow y = -1 \rightarrow R_F = [-\frac{\varepsilon}{2}, -1]$$

$$الف) y = \left| \frac{m-1}{\varepsilon m} \right| \rightarrow f(m) = \frac{m-1}{\varepsilon m}$$

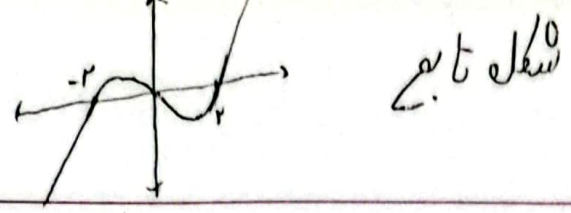
$$\rightarrow f(m) = \left| \frac{m-1}{\varepsilon m} \right| \rightarrow y = \frac{m}{\varepsilon}$$

$$\rightarrow R_F = (0, +\infty)$$

$$ب) y = \left| \frac{q m - 1}{-m + \varepsilon m} \right| \rightarrow \frac{q(m-1)}{\varepsilon(m-1)} \rightarrow \left| \frac{q}{\varepsilon} \right| \rightarrow \frac{q}{\varepsilon} \rightarrow R_F = \left[\frac{q}{\varepsilon} \right]$$

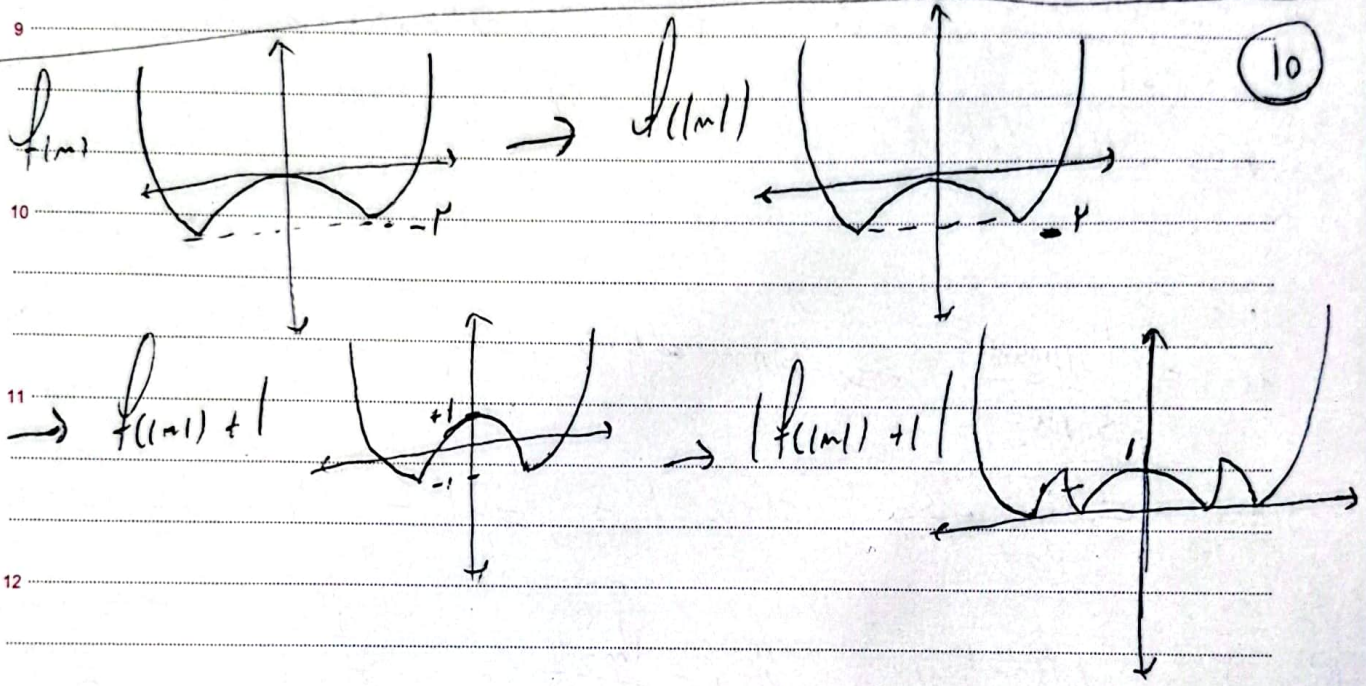
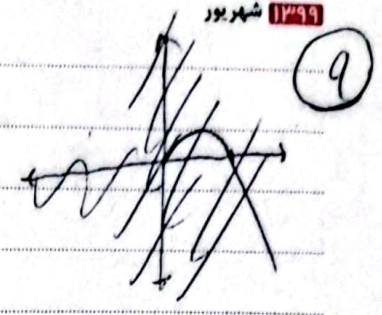
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① $y = a|m| - km \rightarrow |m| \leq 0 \rightarrow a = 0$

8 $\frac{-m^2 - km}{-m^2 - km} \rightarrow R_f \leq \mathbb{R}$



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