

A. فرض کنید

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$$Df(x) = [-r, r]$$

$$f\left(\frac{x_2+r}{r}\right)$$

$$-r \leq \frac{x_2+r}{r} \leq r$$

$$-1 \leq x_2+r \leq 1$$

$$-1-r \leq x_2 \leq 1-r \Rightarrow -r \leq x_2 \leq r$$

$$Df' = [-r, r]$$

$$f(x_2, r) \rightarrow D = [-r, r]$$

$$-r \leq x_2 \leq r \Rightarrow -r \leq x_2 \leq r \Rightarrow -r \leq x_2 \leq r$$

$$Df(x) =$$

$$Df = [-r, r]$$

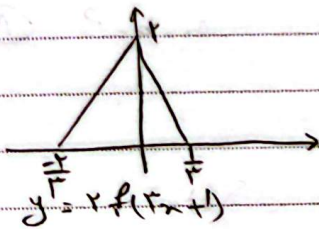
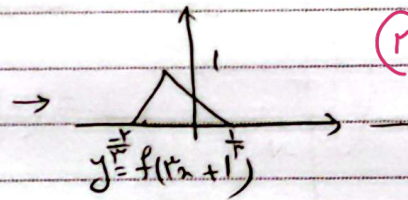
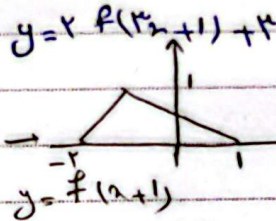
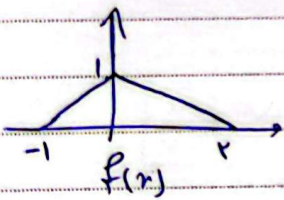
$$f\left(\frac{x_2+r}{r}\right) \rightarrow D = [-1, r]$$

$$\left[\frac{x_2+r}{r} = a \right] \left[\frac{x_2-r}{r} = -1 \right] \left[-1, a \right]$$

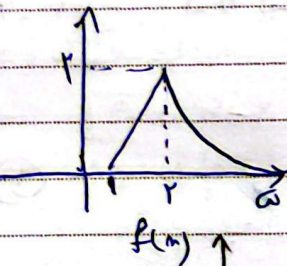
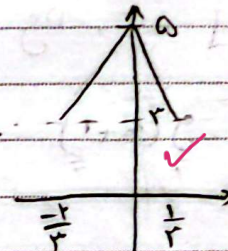
$$f(r-x_2) = -1 \leq r-x_2 \leq 0$$

$$-r \leq -x_2 \leq r \Rightarrow r \geq x_2 \geq -r \Rightarrow -r \leq x_2 \leq r$$

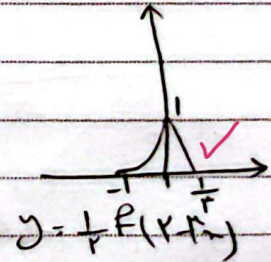
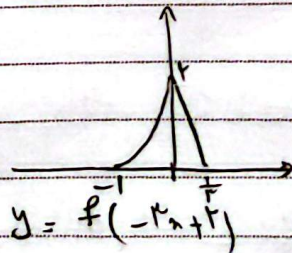
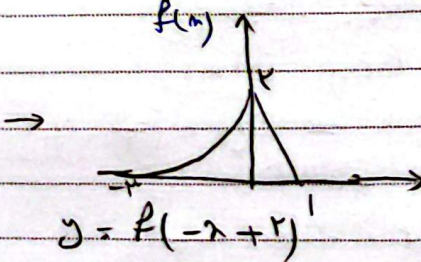
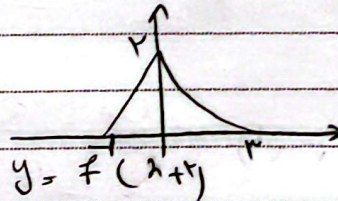
$$D_{f(r-x_2)} = \left(-\frac{r}{a}, \frac{r}{a} \right]$$



$$y = r f(x_2+1) + r$$



$$y = \frac{1}{r} (f(r-x_2))$$



$$y = a(x-h)^2 + k$$

$$y = \frac{1}{r}(x-2)^2 + k \rightarrow \frac{1}{r}(x-2)^2 = -k \rightarrow (x-2)^2 = -kr \rightarrow \begin{cases} x-2 = \sqrt{-kr} \rightarrow x = 2 + \sqrt{-kr} \\ x-2 = -\sqrt{-kr} \rightarrow x = 2 - \sqrt{-kr} \end{cases}$$

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$$y = \frac{1}{r}x^2 + \frac{4}{r}x + 1 \rightarrow \left| \frac{-b}{2a} = \frac{-\frac{4}{r}}{\frac{2}{r}} = -\frac{4}{2} = -2 \right. \quad (2)$$

$$\left| \frac{1}{r} \times \frac{9}{r} + \frac{4}{r} \times \frac{4}{r} + 1 = \frac{9}{r} + \frac{16}{r} + \frac{r}{r} = \frac{25}{r} \right.$$

$$\left| \frac{1}{r} \right. \xrightarrow{\text{denom}} \left| \frac{r}{r} \right. \rightarrow r = \frac{r}{\frac{1}{r}} = \frac{r \cdot r}{1} = \frac{r^2}{1}$$

$$\text{Subst} - y = f\left(x - \frac{r}{2}\right) + \frac{r}{4}$$

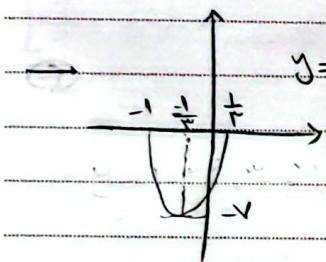
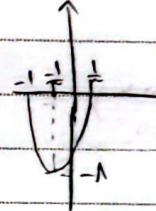
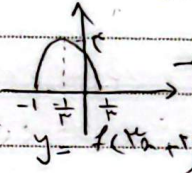
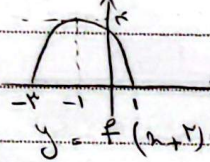
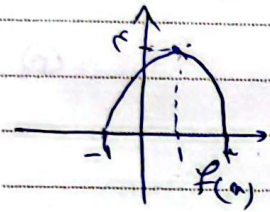
$$y = \frac{1}{r}\left(x - \frac{r}{2}\right)^2 + \frac{r}{4}\left(x - \frac{r}{2}\right) + 1 + \frac{r}{4} = \frac{1}{r}x^2 - \frac{r}{2}x + \frac{r^2}{4} + \frac{r}{4}x - \frac{r^2}{8} + 1 + \frac{r}{4} = \frac{1}{r}x^2 + \frac{r^2 - r}{4}x + \frac{r^2 - r + 4}{4}$$

$$x^2 - rx + r = 0 \rightarrow x = 1, x = \frac{r}{2} = 1$$

$$y = 1 - rf(rx + r) \rightarrow A(\alpha, \beta) \text{ (center)}$$

$$\alpha\beta = 0 \quad (3)$$

$$y = \frac{r}{4}(rx + r)$$



$$y = 1 - rf(rx + r)$$

$$\rightarrow A\left(\frac{1}{r}, -r\right) \Rightarrow \alpha\beta = \frac{1}{r} \times -r = -1 \quad (4)$$

$$D_f = (a, r] \quad , \quad D_g = [1, b)$$

$$a - b = ? \quad (1)$$

$$y = f(x-1) + g(x+1) \rightarrow D = (-r, a)$$

$$\begin{cases} a < x-1 \leq \varepsilon \rightarrow x \leq a+1 \rightarrow D = (a+1, a] \\ x+1 < b \rightarrow x < b-1 \rightarrow D = [-r, b-1) \end{cases} \rightarrow \begin{cases} a+1 = -r \rightarrow a = -r-1 \\ b-1 = a \rightarrow b = a \end{cases}$$

$$a - b = -r - 1 - (-r - 1) = 0$$

$$y_1 = f\left(\frac{r}{2} + 1\right) \rightarrow \begin{matrix} D_1 = [-r, a] \\ R_{y_1} = [-1, r] \end{matrix}$$

$$\rightarrow \frac{r}{2} + 1 \leq x \leq \frac{a}{2} + 1 \rightarrow \frac{1}{r} \leq x \leq \frac{1}{r} \quad (5)$$

$$\Rightarrow D_{f(x)} = \left[-\frac{1}{r}, \frac{1}{r}\right]$$

$$R_{f(x)} = [-1, r]$$

$$y_r = \sqrt{|rf(x) - r|} \rightarrow |rf(x) - r| \leq \varepsilon \rightarrow \sqrt{|rf(x) - r|} \leq \frac{\varepsilon}{r} \Rightarrow D_{y_r} = \left[\frac{1}{r}, \frac{1}{r}\right]$$

$$R_{y_r} \rightarrow -1 \leq f(x) \leq r \rightarrow -r \leq rf(x) \leq \varepsilon \rightarrow \sqrt{|rf(x) - r|} \leq 1 \rightarrow$$

$$0 \leq |rf(x) - r| \leq \varepsilon \rightarrow \sqrt{|rf(x) - r|} \leq \sqrt{\varepsilon} \Rightarrow R_{y_r} = [0, \sqrt{\varepsilon}]$$

Arman

$$f(n) = \left| \frac{n+1}{n-1} \right| \xrightarrow[\text{derivative}]{\text{substitution}} g(n) = \left| \frac{(n-1)+1}{1(n-1)+1} \right| + 1 = \textcircled{1.5}$$

$$\left| \frac{n-1}{n-1} \right| + 1$$

$$n + g(n) < 0 \rightarrow n + \left| \frac{n-1}{n-1} \right| + 1 < 0 \xrightarrow[\text{derivative}]{\text{substitution}} n+1 < 0 \rightarrow n < -1 \textcircled{1}$$

$$n < -1 \Rightarrow \begin{cases} n-1 < 0 \\ n-1 < 0 \end{cases} \Rightarrow +ve \Rightarrow n + \frac{n-1}{n-1} + 1 < 0 \rightarrow \frac{n^2 - n + n - 1 + n - 1}{n-1} < 0$$

$$\frac{n^2 - 2}{n-1} < 0$$

$$\begin{cases} n < -1 \text{ or } \\ \text{substitution} \end{cases} \Rightarrow n^2 - 2 > 0 \rightarrow n^2 > 2 \rightarrow n > \sqrt{2} \text{ or } n < -\sqrt{2} \textcircled{2}$$

$$\textcircled{1} \cap \textcircled{2} \Rightarrow n < -\sqrt{2}$$

$$\Rightarrow \text{domain} = (-\infty, -\sqrt{2})$$