

A. فرض کن

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نکته: $v = \frac{r}{a}$

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

$$f\left(\frac{r_2+r}{r}\right)$$

$$-r \leq \frac{r_2+r}{a} \leq r$$

$$-1 \leq \frac{r_2+r}{a} \leq 1$$

$$-1 \leq \frac{r_2}{a} \leq 1 \Rightarrow -r \leq r_2 \leq r$$

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

$$f(r_2, r) \rightarrow D = [-r, r]$$

$$-r \leq r_2 \leq r \Rightarrow -r \leq r_2 - r \leq r$$

$$Df(x) =$$

$$Df = [-1, 1]$$

$$f\left(\frac{r_2+r}{r}\right) \rightarrow D = [-1, 1]$$

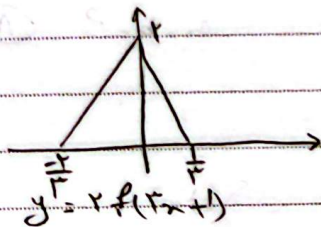
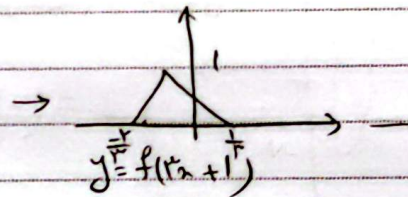
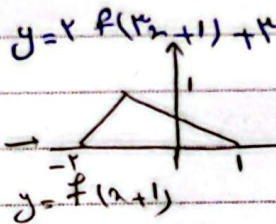
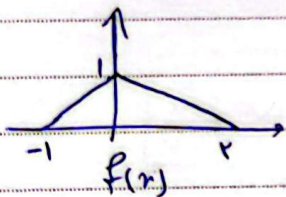
$$\left[\frac{r_2+r}{r} = a \right] \left[\frac{r_2-r}{r} = -1 \right] \left[\frac{r_2+r}{r} = a \right]$$

$$f(r - a r_2) = -1 \leq r - a r_2 \leq 1$$

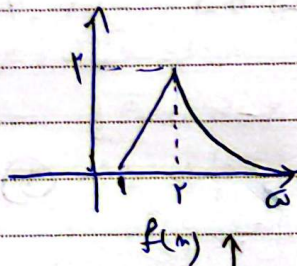
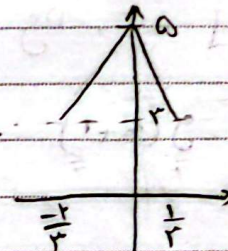
$$-r \leq -a r_2 \leq r$$

$$r \geq a r_2 \geq -r \Rightarrow -\frac{r}{a} \leq r_2 \leq \frac{r}{a}$$

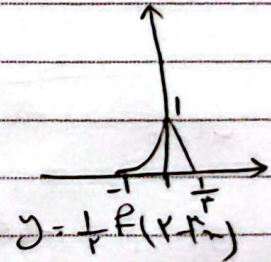
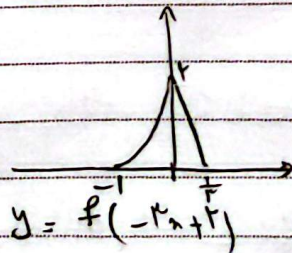
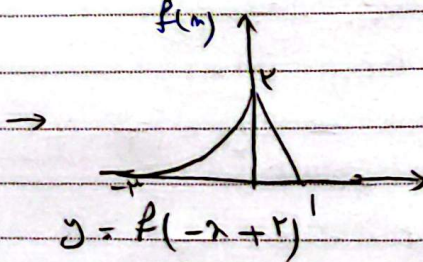
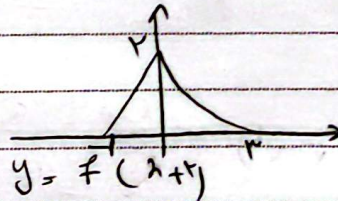
$$D_{f(r-a r_2)} = \left(-\frac{r}{a}, \frac{r}{a}\right]$$



$$y = r f(r_2 + 1) + r$$



$$y = \frac{1}{r} (f(r - r_2))$$



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

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

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

$$\left| \frac{1}{r} \times \frac{9}{16} + \frac{4}{r} \times \frac{3}{8} + 1 = \frac{9}{16r} + \frac{12}{8r} + 1 = \frac{9}{16r} + \frac{24}{16r} + 1 = \frac{33}{16r} + 1 \right.$$

$$\left| \frac{1}{r} \right. \xrightarrow{\text{denom}} \left| \frac{r}{r} \right.$$

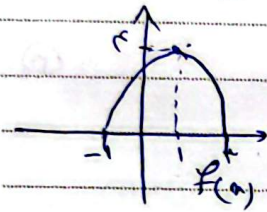
$$\left| r = \frac{r}{1} = \frac{9-4}{16} = \frac{5}{16} \right.$$

$$\left| k = \frac{33}{16} = \frac{33 \times 16}{16} = \frac{528}{16} = \frac{33}{1} \right.$$

$$\text{So } y = f(x-h) + \frac{528}{16}$$

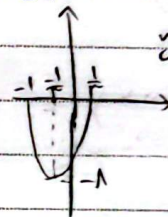
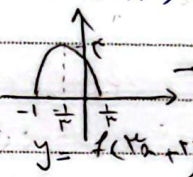
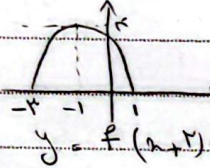
$$y = \frac{1}{r}(x-\frac{14}{2})^2 + \frac{r}{2}(x-\frac{14}{2}) + 1 + \frac{528}{16} = \frac{1}{r}x^2 + \frac{r}{2}x - \frac{14}{2} + \frac{r}{2}x - \frac{14}{2} + \frac{528}{16}$$

$$= \frac{1}{r}x^2 + \frac{r}{2}x - \frac{14}{2} + \frac{r}{2}x - \frac{14}{2} + \frac{528}{16} = \frac{1}{r}x^2 + \frac{r}{2}x - \frac{14}{2} + \frac{r}{2}x - \frac{14}{2} + \frac{528}{16}$$



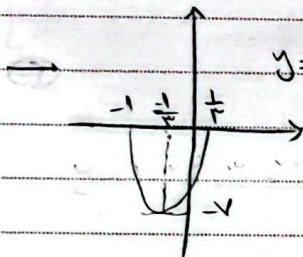
$$x^2 - 4x + 4 = 0 \rightarrow x = 1, x = \frac{4}{2} = 2$$

$$y = 1 - r f(x+h) \rightarrow A(x, \beta) \text{ (vertex)}$$



$$x, \beta = \text{⑤}$$

$$y = f(x+h)$$



$$y = 1 - r f(x+h)$$

$$\rightarrow A(\frac{1}{r}, -v) \Rightarrow x, \beta = \frac{1}{r}x - v = \frac{v}{r}$$

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

$$a, b = \text{①}$$

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

$$\left\{ \begin{array}{l} a < x-1 \leq \frac{a}{r} \rightarrow x < a+1 \leq a \rightarrow D = (a+1, a] \\ x+1 < b \rightarrow x < b-1 \rightarrow D = (-r, b-1) \end{array} \right\} \rightarrow \begin{cases} a+1 = a \rightarrow a = -1 \\ a+1 = -r \rightarrow a = -r-1 \end{cases}$$

$$\rightarrow b-1 = a \rightarrow b = a+1 = -r-1+1 = -r$$

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

$$y_1 = f(\frac{r}{r}+1) \rightarrow D = [-r, a]$$

$$R_{y_1} = [-1, r]$$

$$\rightarrow \frac{r}{r}+1 \leq x < \frac{a}{r}+1 \rightarrow \frac{1}{r} \leq x < \frac{a}{r}+1$$

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

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

$$y_r = \sqrt{r f(x) - r} \rightarrow |r f(x) - r| \geq 0 \rightarrow r f(x) \geq r \rightarrow f(x) \geq 1 \rightarrow D_{y_r} = [\frac{1}{r}, \frac{a}{r}]$$

$$R_{y_r} \rightarrow -1 \leq f(x) \leq r \rightarrow -r \leq r f(x) \leq r^2 \rightarrow -r \leq r f(x) \leq r^2 \rightarrow f(x) \leq r \rightarrow D_{y_r} = [0, \sqrt{a}]$$

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

Arman

$$f(n) = \left| \frac{n+1}{n-1} \right| \xrightarrow[\text{derivative}]{\text{substitution}} g(n) = \left| \frac{(n-1)+1}{1(n-1)+1} \right| + 1 = \left| \frac{n}{n} \right| + 1 = 2$$

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

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

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

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

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

$$(1) \cap (2) \Rightarrow n < -1$$

$$\Rightarrow \text{domain} = (-\infty, -1)$$