

۱ $y = \frac{1}{3}n^2 + \frac{2}{3}n + 1 \rightarrow$ $\frac{b}{2a} = \frac{-\frac{2}{3}}{\frac{2}{3}} = -1 \Rightarrow$ $y = \frac{1}{3}(n-1)^2 + \frac{2n}{3}$
 $g(n) = a(n-1)^2 + 3$ $a = \frac{1}{3} \Rightarrow g(n) = \frac{1}{3}(n-1)^2 + 3 \rightarrow \frac{1}{3}(n-1)^2 + 3 = 0 \Rightarrow (n-1)^2 = -9 \Rightarrow n-1 = \pm 3 \Rightarrow n = 4, -2$ (۲)

۲ $B: (1, 4) \rightarrow A: (\alpha, \beta)$ $f(n+2) = f(1) \Rightarrow \alpha = \frac{1}{3} = \alpha$ $1-2f(1) = 1-2(4) = -7 = \beta$ $\alpha/\beta = \frac{1}{-7}$ (۲)

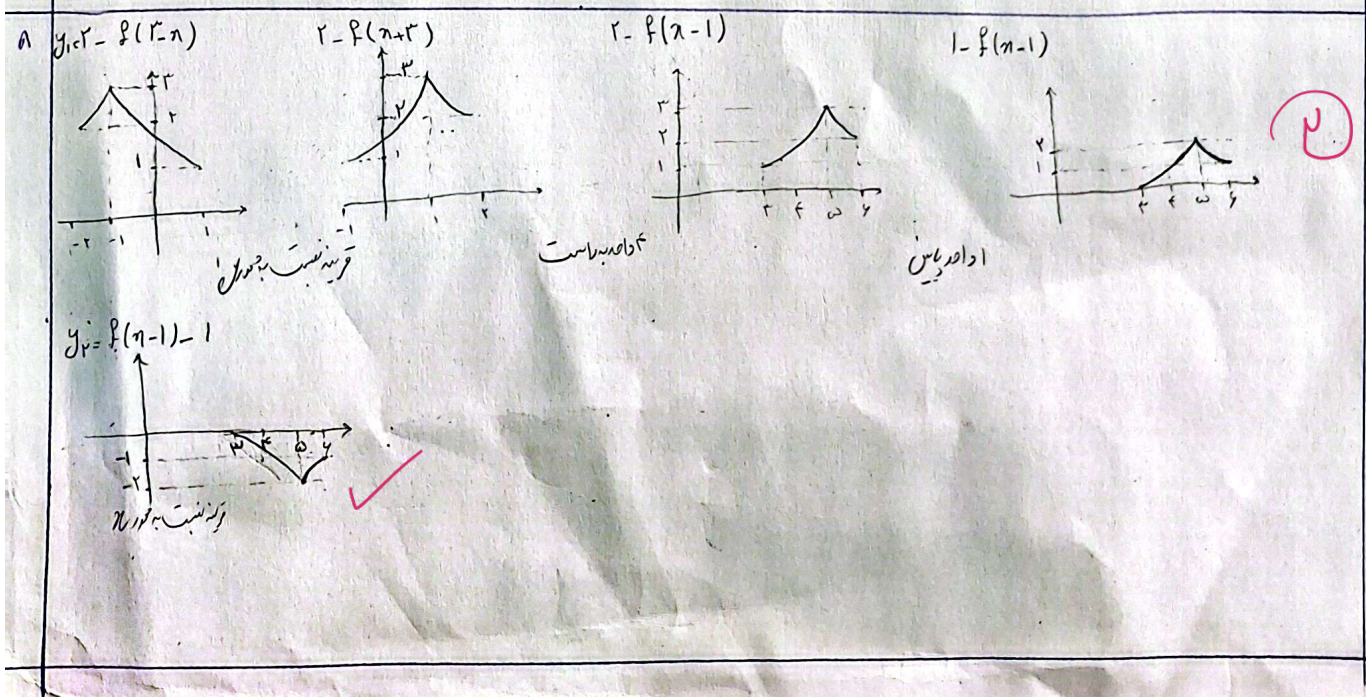
۳ $y = 2 - \sqrt{2n} \rightarrow f(n) = 2 - \sqrt{2(n+1)} \rightarrow g(n) = 2 - \sqrt{2n+2} \rightarrow h(n) = \sqrt{2n+2} + 2$
 $\sqrt{2n+2} + 2 = \frac{1}{2} \Rightarrow \sqrt{2n+2} = \frac{1}{2} - 2 = -\frac{3}{2} \Rightarrow 2n+2 = \frac{9}{4} \Rightarrow 2n = \frac{1}{4} \Rightarrow n = \frac{1}{8}$ (۲)

۴ $D_f = (a, 2) \rightarrow a+1 < 2 \Rightarrow a < 1$ $D_g = [-1, b) \rightarrow -1 < n+1 < b \Rightarrow -2 < n < b-1$
 $D_f \cap D_g = (a+1, 2) \cap [-2, b-1) = (-2, 2) \Rightarrow a+1 = -2 \Rightarrow a = -3$ $b-1 = 2 \Rightarrow b = 3 \rightarrow a-b = -6$ (۲)

۵ $2 < x < 5 \Rightarrow \frac{2}{3} < \frac{x}{3} < \frac{5}{3} \Rightarrow \frac{1}{3} < \frac{x}{3} + 1 < \frac{4}{3} \rightarrow D_f = [\frac{1}{3}, \frac{4}{3}]$
 $-1 < y < 2 \Rightarrow R_f = [-1, 2]$
 $y = \sqrt{12f(n)-5}$
 $12f(n)-5 \geq 0 \Rightarrow 12f(n) \geq 5 \Rightarrow f(n) \geq \frac{5}{12}$ (۲)

۶ $y = \frac{n}{a}[an]$ $a \in \mathbb{N} \rightarrow [an] \in \mathbb{N} \rightarrow y \in \mathbb{N}$
 $y = \frac{1}{a}[an] \Rightarrow \frac{1}{a} \leq \frac{1}{a}[an] \leq \frac{1}{a} \Rightarrow a \leq 1 \Rightarrow a = 1$ (۲)

۷ $f(n) = \log_2 n \rightarrow h(n) = \log_2(n+2) \rightarrow p(n) = \log_2(n+2) \rightarrow T(n) = -\log_2(n+2) + 3 \rightarrow g(n) = -\log_2(n+2) + 3$
 $g(1) = -\log_2(3) + 3 = -1$ $g(4) = -\log_2(6) + 3 = -1$ $g(1) + g(4) = (-1) + (-1) = -2$ (۲)



$$f(n) = \left| \frac{n+1}{r(n+1)} \right| \rightarrow h(n) = \left| \frac{(n-2)+1}{r(n-2)+1} \right| = \left| \frac{n-1}{r(n-2)+1} \right| \rightarrow g(n) = \left| \frac{n-1}{r(n-2)+1} \right| + 1$$

$$n + g(n) < 0 \Rightarrow n + \left| \frac{n-1}{r(n-2)+1} \right| + 1 < 0 \Rightarrow \left| \frac{n-1}{r(n-2)+1} \right| < -1 - n$$

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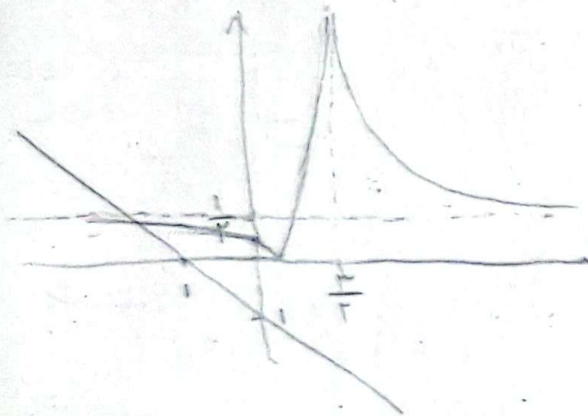
$$\frac{n-1}{r(n-2)+1} < -1 - n \Rightarrow n-1 > -[n^2 + n + 1] \Rightarrow n^2 - 1 > 0$$

$$\Rightarrow n^2 > 1 \rightarrow n > 1$$

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

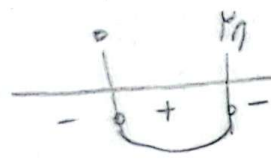
$$n < -\sqrt{2}$$

2



$$g(n) = \sqrt{r(n)f(n)} - f(n)$$

$$r(n)f(n) - f(n)^2 > 0 \xrightarrow{f(n)=t} -t^2 + rnt > 0$$



$$0 < t < rn \rightarrow 0 < f(n) < rn$$

1.5

$$f(n) = k(n-2)^m + \sqrt{2} \rightarrow (\dots) \quad k = \frac{\sqrt{2}}{\lambda}$$

$$0 \leq f(n) \leq n \rightarrow f(n) = 0 \rightarrow n = 0$$

$$0 \leq f(n) \leq n \rightarrow n = \frac{1}{\epsilon} \rightarrow 0 \leq n \leq \frac{1}{\epsilon}$$

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