

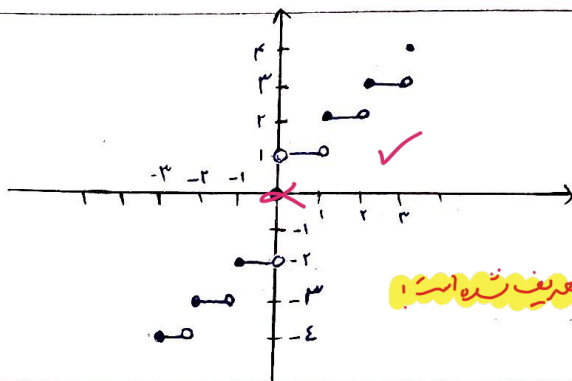
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الف) $f(n) = 2 \sin^2(n + \frac{\pi}{3}) - 1 \xrightarrow{0 \leq \sin^2(n + \frac{\pi}{3}) \leq 1} R_f = [-1, 1]$

ب) $g(n) = 2 \cos^2 n - 2 \xrightarrow{-1 \leq \cos^2 n \leq 1} R_g = [-2, 0]$

$y = \frac{n}{|n|} + [n]$

$\begin{cases} y = -2 & -2 \leq n < -1 \\ y = -1 & -1 \leq n < 0 \\ y = 0 & 0 \leq n < 1 \\ y = 1 & 1 \leq n < 2 \\ y = 2 & 2 \leq n < 3 \end{cases} \quad \begin{cases} y = 0 & n = 0 \\ y = 2 & n = 2 \end{cases}$

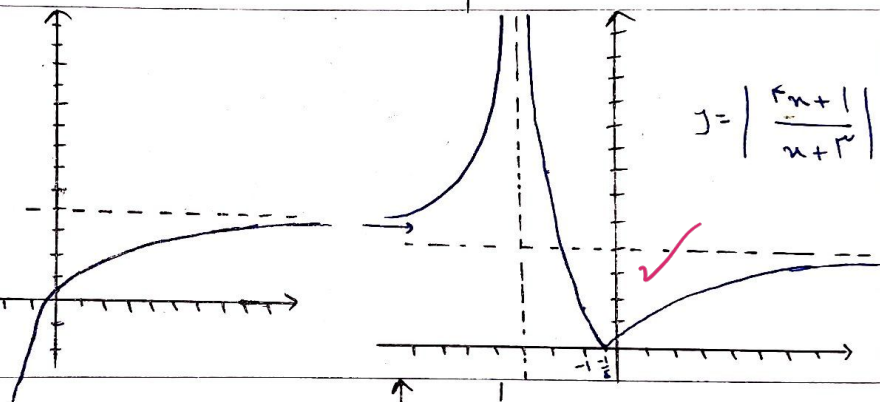


صفر تعریف شده است

$y = \left| \frac{n+1}{n+2} \right|$

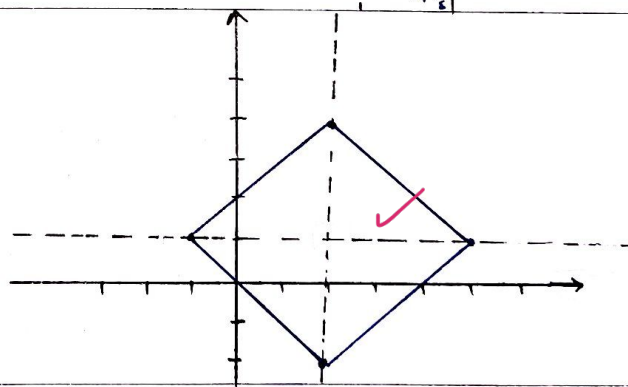
$y = \frac{n+1}{n+2}$

$y = \left| \frac{n+1}{n+2} \right|$



$|n-2| + |y-1| = 2$

$\begin{cases} y = -n+3 & n \geq 2, y \geq 1 \\ y = n+1 & n \leq 2, y \geq 1 \\ y = n-3 & n \geq 2, y \leq 1 \\ y = -n & n \leq 2, y \leq 1 \end{cases}$



الف) $f(n) = n + \frac{1}{n} + 2 \sqrt{n + \frac{1}{n}} \rightarrow \begin{cases} \sqrt{n + \frac{1}{n}} = \sqrt{2} \rightarrow y_{\min} = 2 + 2\sqrt{2} \\ \sqrt{n + \frac{1}{n}} = +\infty \rightarrow y_{\max} = +\infty \\ \sqrt{n + \frac{1}{n}} = -1 \text{ X} \end{cases} \rightarrow R_f = [2 + 2\sqrt{2}, +\infty)$

ب) $y = -\sin^2 n + 2 \sin n + 3 \rightarrow \begin{cases} \sin n = 1 \rightarrow y_{\max} = 2 \\ \sin n = -1 \rightarrow y_{\min} = 0 \\ \sin n = \frac{-2}{2 \times -1} = 1 \rightarrow y = 2 \end{cases} \rightarrow R_f = [0, 2]$

$$f_n = -\frac{1}{r}n + 1. \quad D_f = \{1, 2, 3, \dots, 9\}$$

$$\rightarrow a_1 = \frac{r9}{r}$$

$$\rightarrow a_9 = 0$$

$$\rightarrow S_n = \frac{n}{r}(a_1 + a_n) \rightarrow S = \frac{9}{r}\left(\frac{r9}{r} + 0\right) = \frac{9}{r} \times \frac{8}{r} = \frac{72}{r}$$

$$f_n = \sqrt{an^r + bn + c} \quad D_f = [r, +\infty) \rightarrow \boxed{a=1} \rightarrow \begin{cases} rb + c = 0 \\ rb + c = 1 \end{cases} \rightarrow \boxed{b=1} \quad \boxed{c=-r}$$

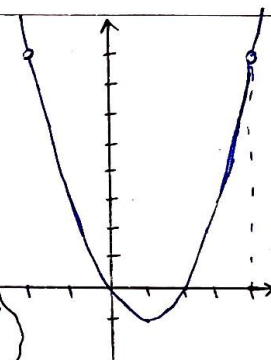
$$g_n = \sqrt{n^r + 2} \rightarrow R_f = \sqrt{[2, +\infty)} \Rightarrow R_f = [r, +\infty)$$

$$f_n = \frac{n(n^r - 2)}{n+r} = n(n-r) = n^r - rn \quad (n \neq -r)$$

$$R_f = [c, +\infty) - \{n\} \rightarrow n^r - rn = n \rightarrow \begin{cases} n = -r \\ n = r \end{cases}$$

$$\rightarrow D_f = \mathbb{R} - \{a, b\} \rightarrow \begin{cases} \boxed{a=-r} \\ \boxed{b=r} \end{cases} \rightarrow f\left(\frac{a+b}{rc}\right) = f\left(\frac{-r+r}{r(-1)}\right) = f(-1) = r$$

$$R_f = [c, +\infty) - \{n\} \rightarrow \boxed{c=-1}$$

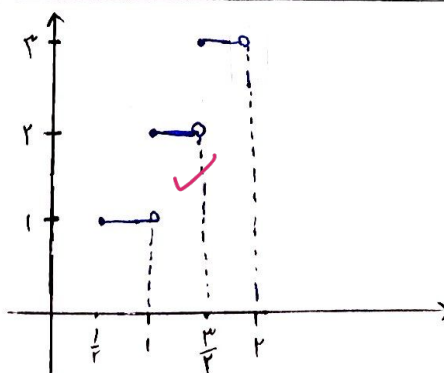


$$y = \sqrt[n]{n^r + an^r + bn - n} \xrightarrow{\text{decomp.}} y = \sqrt[n]{(n-r)^n} = \sqrt[n]{n^r - rn^r + 1rn - n} = n - r$$

$$\rightarrow f_n = n - r \quad D_f = [-r, r] \rightarrow R_f = [-n, 1.]$$

$$J = [n] + \left[n + \frac{1}{r}\right]$$

$$\begin{cases} y=1 & \frac{1}{r} < n < 1 \\ y=2 & 1 < n < \frac{r}{r} \\ y=3 & \frac{r}{r} < n < r \end{cases}$$



$$\frac{1}{r} < \frac{1}{r} \leq \frac{r}{r}$$