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نام و نام خانوادگی پاسخنامه تشریحی تکلیف شماره ۳۰ کلاس تاریخ
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$$y = \frac{x^2 + x + 2}{x - 1} \rightarrow yx - y = x^2 + x + 2$$

$$\Rightarrow x^2 + (1 - y)x + 2 + y = 0 \rightarrow x = \frac{-(1 - y) \pm \sqrt{\Delta}}{1 \times 1} \xrightarrow{\Delta \geq 0} \Delta \geq 0 \Rightarrow (1 - y)^2 - 4(2 + y) \geq 0$$

$$y^2 - 2y + 1 - 8 - 4y \geq 0 \rightarrow y^2 - 6y - 7 \geq 0 \rightarrow (y - 7)(y + 1) \geq 0 \rightarrow y \leq -1 \text{ یا } y \geq 7$$

$$R_f = (-\infty, -1] \cup [7, +\infty)$$

الف) $y = 2x^2 - 5x + 1$ $\rightarrow$ $\Delta = 25 - 8 = 17$ $\rightarrow$ $x = \frac{5 \pm \sqrt{17}}{4}$ $\rightarrow$ $y = \frac{17}{4}$ $\rightarrow$ $R = [\frac{17}{4}, +\infty)$

ب) $y = \sqrt{-x^2 + 4x - 5}$ $\rightarrow$ $-x^2 + 4x - 5 \geq 0$ $\rightarrow$ $x^2 - 4x + 5 \leq 0$ $\rightarrow$ $\Delta = 16 - 20 = -4 < 0$ $\rightarrow$ $R = [0, 2]$

ج) $y = \sqrt{x^2 + 4x + 1}$ $\rightarrow$ $x^2 + 4x + 1 \geq 0$ $\rightarrow$ $\Delta = 16 - 4 = 12$ $\rightarrow$ $x = \frac{-4 \pm \sqrt{12}}{2} = -2 \pm \sqrt{3}$ $\rightarrow$ $R = [-2 - \sqrt{3}, +\infty)$

د) $y = (x^3 - 4x^2 + 7x + 6)$ $\rightarrow$ $R = \mathbb{R}$

الف) $y = \frac{x^2 + 1}{x - 2}$ $\rightarrow$ $y(x - 2) = x^2 + 1$ $\rightarrow$ $x^2 - yx + 2y + 1 = 0$ $\rightarrow$ $\Delta = y^2 - 4(2y + 1) \geq 0$ $\rightarrow$ $y^2 - 8y - 4 \geq 0$ $\rightarrow$ $y \leq -2$ یا $y \geq 10$ $\rightarrow$ $R = (-\infty, -2] \cup [10, +\infty)$

ب) $y = \sqrt{\frac{x + 1}{x - 2}}$ $\rightarrow$ $\frac{x + 1}{x - 2} \geq 0$ $\rightarrow$ $x \leq -1$ یا $x \geq 2$ $\rightarrow$ $R = (-\infty, -1] \cup [2, +\infty)$

ج) $y = \frac{x^2 + 4}{\sqrt{x^2 + 3}}$ $\rightarrow$ $y\sqrt{x^2 + 3} = x^2 + 4$ $\rightarrow$ $y^2(x^2 + 3) = (x^2 + 4)^2$ $\rightarrow$ $(y^2 - 4)x^2 + 3y^2 - 16y + 16 = 0$ $\rightarrow$ $\Delta = (3y^2 - 16y + 16)^2 - 4(y^2 - 4)^2 \geq 0$ $\rightarrow$ $R = [\frac{1}{3}, +\infty)$

د) $y = \frac{x^2 + 1}{x + 2}$ $\rightarrow$ $y(x + 2) = x^2 + 1$ $\rightarrow$ $x^2 - yx - 2y + 1 = 0$ $\rightarrow$ $\Delta = y^2 - 4(-2y + 1) \geq 0$ $\rightarrow$ $y^2 + 8y - 4 \geq 0$ $\rightarrow$ $y \leq -4 - 2\sqrt{5}$ یا $y \geq -4 + 2\sqrt{5}$ $\rightarrow$ $R = (-\infty, -4 - 2\sqrt{5}] \cup [-4 + 2\sqrt{5}, +\infty)$

$y = \frac{x^2 + 4}{x^2 - 1}$ $\rightarrow$ $y(x^2 - 1) = x^2 + 4$ $\rightarrow$ $(y - 1)x^2 - y = 0$ $\rightarrow$ $x^2 = \frac{y}{y - 1}$ $\rightarrow$ $\frac{y}{y - 1} \geq 0$ $\rightarrow$ $y \leq 0$ یا $y \geq 1$ $\rightarrow$ $R = (-\infty, 0] \cup [1, +\infty)$

$y = \frac{x^2 + 4}{x^2 - 1}$ $\rightarrow$ $\frac{y}{y - 1} \in \mathbb{R} \Rightarrow y \neq 1$ $\rightarrow$ $\max(x^2) \rightarrow +\infty \rightarrow y = 1$ $\rightarrow$ $\min(x^2) \rightarrow 0 \rightarrow y = -4$ $\rightarrow$ $R = (-\infty, -4] \cup [1, +\infty)$

$y = \frac{2 \sin x - 1}{\sin x + 2}$ $\rightarrow$ $y(\sin x + 2) = 2 \sin x - 1$ $\rightarrow$ $(y - 2) \sin x = 4y - 1$ $\rightarrow$ $\sin x = \frac{4y - 1}{y - 2}$ $\rightarrow$ $|\frac{4y - 1}{y - 2}| \leq 1$ $\rightarrow$ $R = [-\frac{3}{5}, \frac{1}{5}]$

$\max \sin(x) = 1 \rightarrow \frac{4y - 1}{y - 2} = 1 \rightarrow y = \frac{1}{5}$ $\rightarrow$ $\min \sin(x) = -1 \rightarrow \frac{4y - 1}{y - 2} = -1 \rightarrow y = -\frac{3}{5}$ $\rightarrow$ $R = [-\frac{3}{5}, \frac{1}{5}]$

$f(n) = \frac{n^2 - n + \frac{1}{2}}{n^2 - n + 1} \xrightarrow{0 \neq 2.5} n^2 - n + 1 \neq 0$ $\begin{cases} a > 0 \\ \Delta < 0 \\ (1-a) < 0 \end{cases} \Rightarrow \Delta > 0, \Delta < 0 \Rightarrow D_f = \mathbb{R}$ $y = \frac{n^2 - n + \frac{1}{2}}{n^2 - n + 1} \rightarrow y n^2 - y n + y = n^2 - n + \frac{1}{2}$ $\rightarrow (1-y)n^2 + (y-1)n + \frac{1}{2} - y = 0 \rightarrow n = \frac{-(y-1) \pm \sqrt{\Delta}}{2(1-y)} \rightarrow \Delta \geq 0 \rightarrow (y-1)^2 - 4(\frac{1}{2} - y)(1-y) \geq 0$ $\rightarrow (y-1)(y - \frac{1}{2} + 1) \geq 0 \rightarrow (y-1)(y + \frac{1}{2}) \geq 0$ $\hookrightarrow 1-y \neq 0 \rightarrow y \neq 1$	$\begin{cases} a > 0 \\ \Delta < 0 \\ (1-a) < 0 \end{cases} \Rightarrow \Delta > 0, \Delta < 0 \Rightarrow D_f = \mathbb{R}$ $R \Rightarrow [0, 1)$
الف) $y = n-1 - n-2$ $R \Rightarrow [-2, +\infty)$	ب) $y = n-3 + n+1$ $R \Rightarrow [4, +\infty)$
$y = n-2 - n+2 \leq 1$ $n=2 \rightarrow y=-4$ $n=0 \rightarrow y=0$ $n=-2 \rightarrow y=4$	$n+2=1 \Rightarrow n=-3$ $n=-2 \rightarrow y=4$ $\Rightarrow x \in \mathbb{R} - (-\frac{1}{2}, \frac{1}{2})$
الف) $y = [n] + [\frac{n}{2}]$ $R = \{2, 3\}$ $y = 2 + [n] + [-n]$ $y = 2 + [n] + [-n]$ $n \in \mathbb{Z} \rightarrow y=0$ $n \notin \mathbb{Z} \rightarrow y=-1$	ب) $y = \sin^2 n + \sin n + 1$ $\sin n = t$ $t \rightarrow \max \rightarrow 1 \rightarrow 1+1+1=3$ $t \rightarrow \min \rightarrow 0 \rightarrow 0+0+1=1$ $R_f = [1, 3]$
الف) $y = \sin^2 n - \sin n + 1$ $\sin n \rightarrow \max = 1 \rightarrow 1-1+1=1$ $\sin n \rightarrow \min = -1 \rightarrow 1+1+1=3$ $R = [\frac{1}{2}, 3]$	ب) $y = \sin^2 n + \sin n + 1$ $\sin n = t$ $t \rightarrow \max \rightarrow 1 \rightarrow 1+1+1=3$ $t \rightarrow \min \rightarrow 0 \rightarrow 0+0+1=1$ $R_f = [1, 3]$