

$$y_2 x^3 - 3x^2 + 3x \rightarrow y_2 (x-1)^3 + 1 \rightarrow x^3 \sqrt{y-1} + 1$$

$$\Rightarrow R_f = \mathbb{R}$$

$$y_2 \frac{1}{x^2 - 3x} \Rightarrow y_2 x^2 - 3xy - 1 = 0 \xrightarrow{\text{شکل وجود}} \Delta \geq 0 \rightarrow \{y^2 + 4y \geq 0\}$$

$$\Rightarrow (y+1)4y \geq 0 \rightarrow \frac{+}{+} \frac{-}{-} \frac{+}{+} \rightarrow R_f = (-\infty, -1] \cup [0, +\infty)$$

الف) $y_2 x^2 - 4x + 10$

$$\min \left| \frac{-b}{2a} \right|^2 \frac{c}{a} \rightarrow R_f = [9, +\infty)$$

ج) $y_2 \sqrt{x^2 - 4x - 5}$

$$\min \left| \frac{-b}{2a} \right|^2 \frac{c}{a} \rightarrow \sqrt{-V} \rightarrow R_f = [0, +\infty)$$

ب) $y_2 -x^2 + 4x + 3$

$$\max \left| \frac{-b}{2a} \right|^2 \frac{c}{a} \rightarrow R_f = (-\infty, 12]$$

د) $y_2 \sqrt{9x - x^2}$

$$\max \left| \frac{-b}{2a} \right|^2 \frac{c}{a} \rightarrow \sqrt{V} \rightarrow R_f = [-\infty, 9]$$

الف) $y_2 x^3 - 5x^2 + 3x + 1$

بیشترین توان فرد $\rightarrow R_f = \mathbb{R}$

ج) $y_2 \sqrt{x^3 - 4x^2 + 5x + 1}$

بیشترین توان فرد $\rightarrow R_f = \sqrt{\mathbb{R}} = [0, +\infty)$

ب) $y_2 x^5 - 6x^4 + 3x + 2$

بیشترین توان فرد $\rightarrow R_f = \mathbb{R}$

د) $y_2 (x^5 - 4x^4 + 3x + 1)^2$

بیشترین توان فرد $\rightarrow R_f = (\mathbb{R})^2 \Rightarrow R_f = [0, +\infty)$

الف) $y_2 \frac{3x+1}{x-2} \rightarrow R_f = \mathbb{R} - \left\{ \frac{a}{c} \right\} \rightarrow R_f = \mathbb{R} - \{2\}$

ب) $y_2 \frac{2x+1}{x+1} \rightarrow R_f = \mathbb{R} - \left\{ \frac{a}{c} \right\} \rightarrow R_f = \mathbb{R} - \{2\}$

الف) $y_2 \sqrt{\frac{2x+1}{x+1}} \rightarrow \sqrt{\mathbb{R} - \{2\}} \rightarrow R_f = [0, +\infty) - \{\sqrt{2}\}$

ب) $y_2 \sqrt{\frac{2x+1}{1-x}} \rightarrow \sqrt{\mathbb{R} - \{2\}} \rightarrow R_f = [0, +\infty)$

کابل توجه: در سوال ۶ ب. جانب ها انفعال برقرار نمی شود بلکه در موارد آنجا پیش می رود

الف) $y_2 \frac{2a-3}{a+1} \rightarrow$ $a+1=0 \rightarrow a=-1$ (جانب چپ) $\rightarrow y_2 = 2$ (جانب راست) $a=0 \rightarrow y_2 = -3$ ب) $y_2 \frac{2a-1}{a+2} \rightarrow$ $a+2=0 \rightarrow a=-2$ (جانب چپ) $\rightarrow y_2 = 2$ (جانب راست) $a=0 \rightarrow y_2 = -\frac{1}{2}$	۶																		
الف) $y_2 \sin a + \frac{1}{\sin a}$ $a + \frac{1}{a} \geq 2$ $a + \frac{1}{a} \leq -2$ ب) $y_2 \frac{a^3+1}{a^3} = a^3 + \frac{1}{a^3}$ $\rightarrow a + \frac{1}{a} \geq 2$ $a + \frac{1}{a} \leq -2$ ج) $y_2 \frac{\sqrt[3]{a^3+1}}{\sqrt[3]{a^3}} = \sqrt[3]{a} + \frac{1}{\sqrt[3]{a}} \rightarrow R_f: (-\infty, -2] \cup [2, +\infty)$ د) $y_2 \sqrt{a} + \frac{1}{\sqrt{a}} \xrightarrow{\sqrt{a} \geq 0} \sqrt{a} + \frac{1}{a} \geq 2 \rightarrow R_f = [2, +\infty)$	۷																		
الف) $y_2 a^2 + \frac{1}{a^2+3} = a^2+3 + \frac{1}{a^2+3} - 3 \rightarrow a^2+3 > 0 \rightarrow a + \frac{1}{a} \geq 2$ $\xrightarrow{\text{تقریب}} a \geq 3 \rightarrow y_2 = 3 + \frac{1}{3} = \frac{10}{3} \xrightarrow{a+\frac{1}{a}} [\frac{10}{3}, +\infty) \rightarrow R_f = [\frac{10}{3}, +\infty)$ ب) $y_2 \frac{a^2+t+1}{\sqrt{a^2+t}} = \sqrt{a^2+t} + \frac{1}{\sqrt{a^2+t}} \rightarrow a + \frac{1}{a} \geq 2$ $\sqrt{t} + \frac{1}{\sqrt{t}} \geq \frac{5}{2} \rightarrow R_f = [\frac{5}{2}, +\infty)$	۸																		
$y_2 a-3 + 2a+4$	$f(a) = 1$; $a \geq 3$ $2a+7$; $-\frac{4}{3} < a < 3$ $-4a-1$; $a \leq -\frac{4}{3}$ $f(1) = 1$ $f(-\frac{4}{3}) = \frac{10}{3}$ $f(3) = 13$ $f(-2) = 7$ ۹																		
الف) $y_2 a-2 + 2a+2$ <table border="1"> <tr> <td>1 $2a \geq 6$</td> <td>$\frac{a}{1}$</td> <td>$2a \geq 6$</td> <td>$3a$; $a \geq 2$</td> </tr> <tr> <td>2 $-2 < a < 6$</td> <td>$\frac{a}{1}$</td> <td>$2 < 2a+2 < 6$</td> <td>$a+2$; $-1 < a < 2$</td> </tr> <tr> <td>3 $-2a \geq 2$</td> <td>$\frac{a}{1}$</td> <td>$-2a \geq 2$</td> <td>$-2a$; $a \leq -1$</td> </tr> </table> ب) $y_2 2a-2 - a+1$ <table border="1"> <tr> <td>1 $a-2 \geq -2$</td> <td>$a-2$; $a \geq 1$</td> </tr> <tr> <td>2 $-2 < 2a-2 < 1$</td> <td>$-2a+1$; $-\frac{1}{2} < a < 1$</td> </tr> <tr> <td>3 $-a+2 \geq 1$</td> <td>$-a+2$; $a \leq 1$</td> </tr> </table>	1 $2a \geq 6$	$\frac{a}{1}$	$2a \geq 6$	$3a$; $a \geq 2$	2 $-2 < a < 6$	$\frac{a}{1}$	$2 < 2a+2 < 6$	$a+2$; $-1 < a < 2$	3 $-2a \geq 2$	$\frac{a}{1}$	$-2a \geq 2$	$-2a$; $a \leq -1$	1 $a-2 \geq -2$	$a-2$; $a \geq 1$	2 $-2 < 2a-2 < 1$	$-2a+1$; $-\frac{1}{2} < a < 1$	3 $-a+2 \geq 1$	$-a+2$; $a \leq 1$	$\ln 2 \wedge 3 \rightarrow R_f = [3, +\infty)$ $\ln 2 \wedge 3 \rightarrow R_f = [-2, +\infty)$ ۱۰
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