

Subject:

Year:

Month:

Day:

الف) $y = x^2 - 4 \rightarrow x^2 = y + 4 \rightarrow x = \pm \sqrt{y+4} \rightarrow y + 4 \geq 0 \rightarrow y \geq -4 \rightarrow R_f = [-4, +\infty)$ (1)

ب) $y = x^3 + 1 \rightarrow x^3 = y - 1 \rightarrow x = \sqrt[3]{y-1} \rightarrow R_f = \mathbb{R}$

الف) $y = x^2 - 2x + \frac{1}{x^2} \rightarrow y - 2 = (x-2)^2 \rightarrow \pm \sqrt{y-2} = x-2 \rightarrow \pm \sqrt{y-2} + 2 = x \rightarrow y-2 \geq 0 \rightarrow y \geq 2 \rightarrow R_f = [2, +\infty)$ (2)

ب) $y = x^2 - 2x + 1 \rightarrow x^2 - 2x - y + 1 = 0 \rightarrow x = \frac{2 \pm \sqrt{4+4y}}{2} \rightarrow 4+4y \geq 0 \rightarrow y \geq -1 \rightarrow y \geq -\frac{1}{x} \rightarrow R_f = [-\frac{1}{x}, +\infty)$

الف) $y = \frac{x^2+3}{x^2-2} \rightarrow yx^2 - 2y = x^2 + 3 \rightarrow yx^2 - x^2 = 2y + 3 \rightarrow x^2(y-1) = 2y+3 \rightarrow x^2 = \frac{2y+3}{y-1} \rightarrow x = \pm \sqrt{\frac{2y+3}{y-1}} \rightarrow \frac{2y+3}{y-1} \geq 0 \rightarrow \frac{-\frac{3}{2}}{+} \frac{1}{-} \rightarrow R = (-\infty, -\frac{3}{2}] \cup (1, +\infty)$ (3)

ب) $y = \frac{2|x|+1}{|x|-2} \rightarrow y|x|-2y = 2|x|+1 \rightarrow y|x|-2|x| = 2y+1 \rightarrow |x|(y-2) = 2y+1 \rightarrow |x| = \frac{2y+1}{y-2} \rightarrow \frac{-\frac{1}{2}}{+} \frac{2}{-} \rightarrow R = (-\infty, -\frac{1}{2}] \cup (2, +\infty)$

$y = \frac{1}{x^2 - 2x} \rightarrow yx^2 - 2xy - 1 = 0 \rightarrow x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \rightarrow 4y^2 + 4y \geq 0 \rightarrow 4y(y+1) \geq 0 \rightarrow \frac{-\frac{1}{4}}{+} \frac{0}{-} \rightarrow y \neq 0 \rightarrow y \neq 0 \rightarrow R_f = (-\infty, -\frac{1}{4}] \cup (0, +\infty)$ (4)

الف) $y = x^2 - 2x + 2 \cup \text{ext} \begin{cases} -\frac{b}{2a} = \frac{2}{2} = 1 \\ 9-12+2 = -1 \end{cases} \rightarrow R_f = [-1, +\infty)$ (5)

ب) $y = -x^2 + 2x + 2 \cap \text{ext} \begin{cases} -\frac{b}{2a} = \frac{2}{-2} = -1 \\ -1+2+2 = 3 \end{cases} \rightarrow R_f = (-\infty, 3]$

الف) $y = \sqrt{x^2 - 2x + 2} \rightarrow \cup \rightarrow \text{ext} \begin{cases} \frac{2}{2} = 1 \\ 9-12+2 = -1 \end{cases} \Rightarrow \sqrt{[-1, +\infty)} \Rightarrow R_f = [0, +\infty)$ (6)

ب) $y = \sqrt{-x^2 + 2x + 2} \rightarrow \cap \rightarrow \text{ext} \begin{cases} \frac{2}{-2} = -1 \\ -1+2+2 = 3 \end{cases} \Rightarrow \sqrt{(-\infty, 3]} \Rightarrow R_f = [0, \sqrt{13}]$

الف) $y = x^4 + 2x^2 + 2x + 1 \rightarrow R_f = \mathbb{R}$ (7)

ب) $y = \sqrt{x^4 + 2x^2 + 2x + 1} \rightarrow R_f = \sqrt{\mathbb{R}} = [0, +\infty)$

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

(3)

ب) $y = \sqrt{\frac{3x+1}{x+3}} \rightarrow \frac{a}{c} = \frac{1}{1} = 1 \rightarrow R_f = [0, +\infty) - \{1\}$

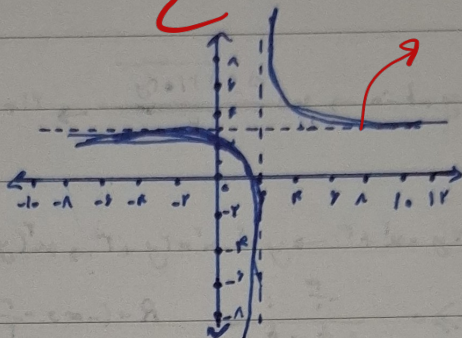
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(1, 5)

الف) $y = \frac{3x+1}{x-2}$

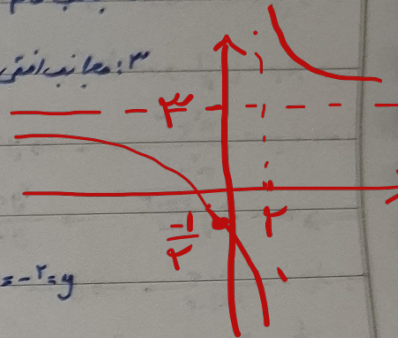
$y = 0 \rightarrow 3x+1 = 0 \rightarrow x = -\frac{1}{3}$

$x = 0 \rightarrow y = \frac{1}{-2} = -\frac{1}{2}$



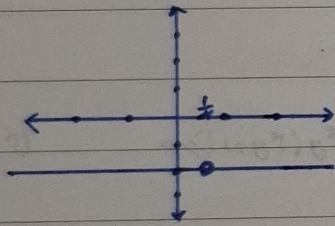
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ب) $y = \frac{3x-2}{1-2x} \rightarrow \frac{3x-2}{-2x+1} \rightarrow R_f = \mathbb{R} - \frac{1}{2} \rightarrow \frac{3x-2}{-2x+1} = \frac{-2(-2x+1)}{-2x+1} = -2 = y$
 $1-2x \neq 0 \rightarrow x \neq \frac{1}{2}$



الف) $y = \cos^2 x + \frac{1}{\cos^2 x} \rightarrow \cos^2 x \geq 0 \rightarrow R_f = [2, +\infty)$

(2)

ب) $y = \sqrt{\frac{x^2+1}{x}} = \sqrt{\frac{x^2}{x} + \frac{1}{x}} = \sqrt{x + \frac{1}{x}} = \sqrt{(-\infty, -2] \cup [2, +\infty)} \rightarrow R_f = (-\infty, -\sqrt{2}] \cup [\sqrt{2}, +\infty)$