

الف) $y = x^2 - 5 \Rightarrow y + 5 = x^2 \Rightarrow x = \sqrt{y+5} \Rightarrow R_f = [-5, +\infty)$

ب) $y = x^3 + 1 \Rightarrow y - 1 = x^3 \Rightarrow \sqrt[3]{y-1} = x \Rightarrow R = \mathbb{R}$ (۲)

الف) $y = x^2 - 6x + 4 \Rightarrow y = x^2 - 6x + 9 - 5 \Rightarrow y = (x-3)^2 - 5 \Rightarrow y - 2 = (x-3)^2$

$\Rightarrow \pm \sqrt{y-2} + 3 = x \Rightarrow R = [2, +\infty)$ ✓

ب) $y = x^2 - 5x + 1 \Rightarrow x^2 - 5x + 1 + 5/4 - 5/4 = x^2 - 5x + 9/4 - 5/4 = (x - 5/2)^2 - 5/4 = y \Rightarrow \pm \sqrt{y + 5/4} + 5/2 = x \Rightarrow R = [-5/4, +\infty)$ (۲)

الف) $y = \frac{x^2 + 3}{x^2 - 2} \Rightarrow y(x^2 - 2) = x^2 + 3 \Rightarrow yx^2 - x^2 = y + 3 \Rightarrow x^2(y-1) = y+3$

$\Rightarrow x^2 = \frac{y+3}{y-1} \Rightarrow x = \pm \sqrt{\frac{y+3}{y-1}} \Rightarrow R = (1, +\infty)$ $\frac{-\frac{3}{2} \pm \frac{1}{2}}{+ \frac{1}{2} - \frac{1}{2}} \rightarrow R_f = (-\infty, -\frac{3}{2}] \cup (\frac{3}{2}, +\infty)$ (۱,۵)

ب) $\frac{y|x|+1}{|x|-4} = y \Rightarrow y|x| - 4y = y|x| + 1 \Rightarrow y|x| - y|x| = 4y + 1$

$\Rightarrow |x|(y-4) = 4y+1 \Rightarrow |x| = \frac{4y+1}{y-4} \Rightarrow R = (4, +\infty)$ $\frac{-\frac{1}{4} \pm \frac{1}{4}}{+ \frac{1}{4} - \frac{1}{4}} \rightarrow R_f = (-\infty, -\frac{1}{4}] \cup (\frac{1}{4}, +\infty)$

$yx^2 - 4xy = 1 \Rightarrow (y)x^2 - (4y)x - 1 = 0$

$\Rightarrow \frac{4y \pm \sqrt{16y^2 + 4y}}{2y} \Rightarrow 16y^2 + 4y \geq 0 \Rightarrow 4y(y+1) \geq 0$ (۱)

$\Rightarrow 4y + y \geq 0 \Rightarrow 4y \geq -y \Rightarrow R_f = \mathbb{R}$ $\frac{-\frac{1}{4}}{+ \frac{1}{4} - \frac{1}{4}}$

$R_f = (-\infty, -\frac{1}{4}] \cup (\frac{1}{4}, +\infty)$

الف) $y = x^2 - 4x + 2 \Rightarrow \min \left| \begin{matrix} x_{\min} = \frac{b}{2a} = 2 \\ y_{\min} = -1 \end{matrix} \right|$

$[-1, +\infty)$

ب) $y = -x^2 + 4x + 2 \Rightarrow \max \left| \begin{matrix} x_{\max} = 2 \\ y_{\max} = 6 \end{matrix} \right|$

$[-\infty, 6]$ (۲)

الف) $y = \sqrt{x^2 - 6x + 4} \Rightarrow \min | -\frac{3}{2} | \Rightarrow R = \sqrt{[-\frac{3}{2}, +\infty)} \Rightarrow R = [0, +\infty)$ ✓

ب) $y = \sqrt{-x^2 + 6x + 10} \Rightarrow \max | \frac{3}{2} | \Rightarrow R = \sqrt{(-\infty, \frac{3}{2}]} \Rightarrow R = [0, \frac{3}{2}]$

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الف) $R_f = \mathbb{R}$ ✓

ب) $R_f = [0, +\infty)$ ✓ (٢)

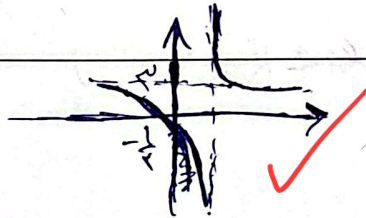
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الف) $\frac{x+1}{x-2} \Rightarrow \mathbb{R} - \{\frac{1}{2}\}$ ✓ (٢)

ب) $y = \sqrt{\frac{x+1}{x+2}} \Rightarrow R_f = [0, \frac{1}{2}) - \{\frac{1}{2}\}$ ✓ (٢)

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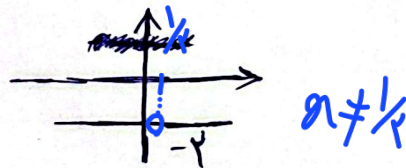
$y = \frac{x+1}{x-2}$



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



$x \neq \frac{1}{2}$

الف) $y = \cos^2 x + \frac{1}{\cos^2 x} \Rightarrow R_f = [2, +\infty)$ ✓ (١٠)

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

$R_f = (-\infty, \sqrt{-2}] \cup [\sqrt{2}, +\infty)$

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