

المستطيل

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الف) $y = x^2 - a$

$-x^2 = -y - a$

$x^2 = y + a$

$x = \sqrt{y + a}$

$y + a \geq 0$
 $y \geq -a$

$R_f = [-a, +\infty)$

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ب) $y = x^2 + 1$

$-x^2 = -y + 1$

$x^2 = y - 1$

$x = \sqrt{y - 1}$

$R_f = [1, +\infty)$

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الف) $y = x^2 - 4x + 4$

$y = (x - 2)^2 + 0$

$(x - 2)^2 = y - 0$ $x = \pm \sqrt{y - 0} + 2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$y - 0 \geq 0$
 $y \geq 0$

$R_f = [0, +\infty)$

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ب) $y = x^2 - 5x + 4$

$\frac{x^2 - 5x + 4}{x^2 - 5x + 4} = 0$

$4 - 5(1 - y) \geq 0$

$4 - 5 + 5y \geq 0$
 $5y \geq 1$
 $y \geq \frac{1}{5}$

$R_f = [\frac{1}{5}, +\infty)$

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الف) $y = \frac{x^2 + 3}{x^2 - 2}$

$y(x^2 - 2) = x^2 + 3$

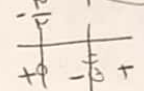
$yx^2 - 2y = x^2 + 3$

$yx^2 - x^2 = 3 + 2y$

$x^2(y - 1) = 3 + 2y$

$x^2 = \frac{3 + 2y}{y - 1}$

$x = \sqrt{\frac{3 + 2y}{y - 1}}$



$R_f = (1, +\infty) \cup (-\infty, -\frac{3}{2}]$

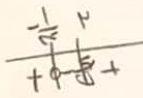
ب) $y = \frac{2|x| + 1}{|x| - 4}$

$y|x| - 4y = 2|x| + 1$

$y|x| - 2|x| = 1 + 4y$

$|x|(y - 2) = 1 + 4y$

$|x| = \frac{1 + 4y}{y - 2}$



$R_f = (2, +\infty) \cup (-\infty, -\frac{1}{4}]$

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$y = \frac{1}{x^2 - 4x}$

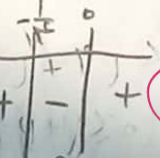
$yx^2 - 4yx = 1$

$\frac{yx^2}{x^2} - \frac{4yx}{x^2} - \frac{1}{x^2} = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$(-4y)^2 - 4(y)(-1) = 0$

$16y^2 + 4y \geq 0$
 $4y(4y + 1) \geq 0$



$R_f = (0, +\infty) \cup (-\infty, -\frac{1}{4}]$

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الف) $y = x^2 - 4x + 4$

a) $\begin{cases} x_{min} = \frac{-b}{2a} = \frac{4}{2} = 2 \\ y_{min} = -4 \end{cases}$

$R_f = [-4, +\infty)$

$R_f = [-\frac{1}{4}, +\infty)$

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ب) $y = x^2 - 4x + 4$

a) $\begin{cases} x_{max} = \frac{-b}{2a} = \frac{-4}{2} = -2 \\ y_{max} = 4 \end{cases}$

$R_f = (-\infty, 4]$

الف) $y = \sqrt{x^2 - 4x + 4} = |x - 2|$

a) $\begin{cases} x_{min} = \frac{-b}{2a} = \frac{4}{2} = 2 \\ y_{min} = -4 \end{cases}$

$R_f = [-4, +\infty)$

$$ب) y = \sqrt{-x^2 + 5x + 1}$$

$-x^2 + 5x + 1$

a.c.

$$x_{max} = \frac{-b}{2a} \quad \frac{-5}{-2} = +2.5$$

$$y_{max} = 1.5$$

$$\sqrt{-\infty, 1.5} = [0, 2.5]$$

✓

$$الذ) y = x^2 + 4x^2 + 2x + 1$$

$$R_f = \mathbb{R}$$

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$$ب) \sqrt{x^2 + 5x^2 + 4x + 1}$$

$$R_f = [0, +\infty)$$

✓

$$الذ) y = \frac{x+1}{x-2}$$

$$R_f = \mathbb{R} - \left\{ \frac{1}{2} \right\}$$

$$ب) \sqrt{\frac{5x+1}{x+2}}$$

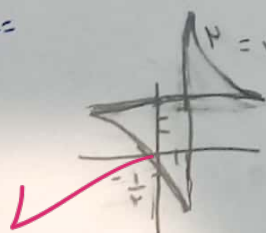
$$R_f = [0, +\infty) - \left\{ \frac{1}{2} \right\}$$

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$$الذ) y = \frac{4x+1}{x-2}$$

$$w = \frac{a}{c} \text{ (نقطة)}$$

$$w = \frac{1}{2}$$



$$ب) y = \frac{5x-2}{1-2x}$$

$$\frac{-2(1-2x)}{1-2x} = -2$$

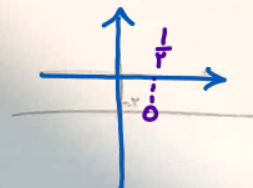
$$y = -2$$

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

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سوال ١٠

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

$$ب) y = \sqrt{\frac{x^2+1}{x}} \rightarrow y = \sqrt{x + \frac{1}{x}} \begin{cases} \rightarrow x > 0 & y \geq \sqrt{2} \\ \rightarrow x < 0 & y \leq -\sqrt{2} \end{cases}$$

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