

الف) $y = x^2 - 2$

$x^2 = y + 2$

$x = \sqrt{y+2}$

$y+2 \geq 0$

$y \geq -2$

$[-2, +\infty)$

ب) $y = x^2 + 1$

$x^2 = y - 1$

$x = \sqrt{y-1}$

$y-1 \geq 0$

$y \geq 1$

$[1, +\infty)$

$\mathbb{R}$

الف) $y = x^2 - 2x + 2$

$\rightarrow y = x^2 - 2x + 1 + 1 \rightarrow y = (x-1)^2 + 1$

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

$y-1 \geq 0$

$y \geq 1$

$[1, +\infty)$

$x-1 = \sqrt{y-1}$

$x = 1 + \sqrt{y-1}$

ب) $y = x^2 - 2x + 1 \rightarrow x = \frac{2}{2} \pm \sqrt{y+1} \rightarrow \mathbb{R} = [-1, +\infty)$

الف) $y x^2 - 2y = x^2 + 2$

$y x^2 - x^2 = 2y + 2 \rightarrow x^2(y-1) = 2y+2$

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

$y \neq 1$

$y-1 \neq 0$

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

$\frac{-1/2}{+0-0+}$

$\mathbb{R} = (-\infty, -1/2] \cup (1, +\infty)$

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

ب) $y|x| - 2y = 2|x| + 1$

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

$\frac{-1/2}{+0-0+}$

$\mathbb{R} = (-\infty, -1/2] \cup (2, +\infty)$

$y \neq 1$

$\mathbb{R} = (-1, 1)$

$y x^2 - 2x = 1$

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

$\Rightarrow \mathbb{R} = (1, +\infty) \cup (-\infty, 0)$

$x(yx - 2x) = 1$

$\mathbb{R} = (-\infty, -1/2] \cup (2, +\infty)$

$\mathbb{R} = \frac{1}{\mathbb{R}} \setminus \left\{ \frac{1}{2} \right\} \cup (-\infty, 0)$

$\frac{-1/2}{+0-0+}$

$x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y}$

$4y^2 + 4y \geq 0$

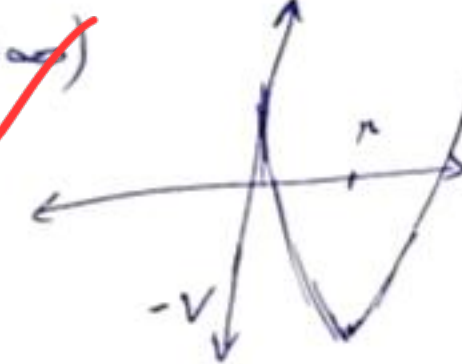
$y \neq 0$

الف) $y = x^2 - 4x + 2$

$\rightarrow x = \frac{-b}{2a} = \frac{4}{2} = 2$

$\hookrightarrow y = \frac{-\Delta}{2a} = \frac{-24}{2} = -12$

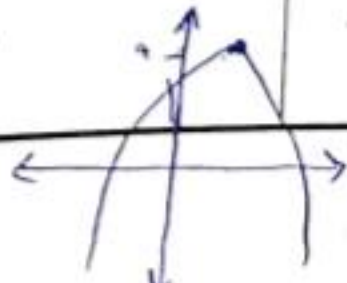
$\mathbb{R} = [-12, +\infty)$



ب) $y = -x^2 + 2x + 2 \rightarrow x = \frac{-2}{-2} = 1$

$y = \frac{(1+2)}{-2} = -1$

$\mathbb{R} = [-1, +\infty)$



$$1) y = \sqrt{x^2 - 4x + 2} \rightarrow y = \frac{-\Delta}{2a} = \frac{(24-1)}{2} = -V \Rightarrow \sqrt{[-V, +\infty)} \Rightarrow R_f = [0, +\infty)$$

$$2) y = \sqrt{-x^2 + 5x + 10} \rightarrow y = \frac{-\Delta}{2a} = \frac{-(14 - (\frac{25}{4}))}{-2} = 1 \Rightarrow \sqrt{(-\infty, 1]} \quad (2)$$

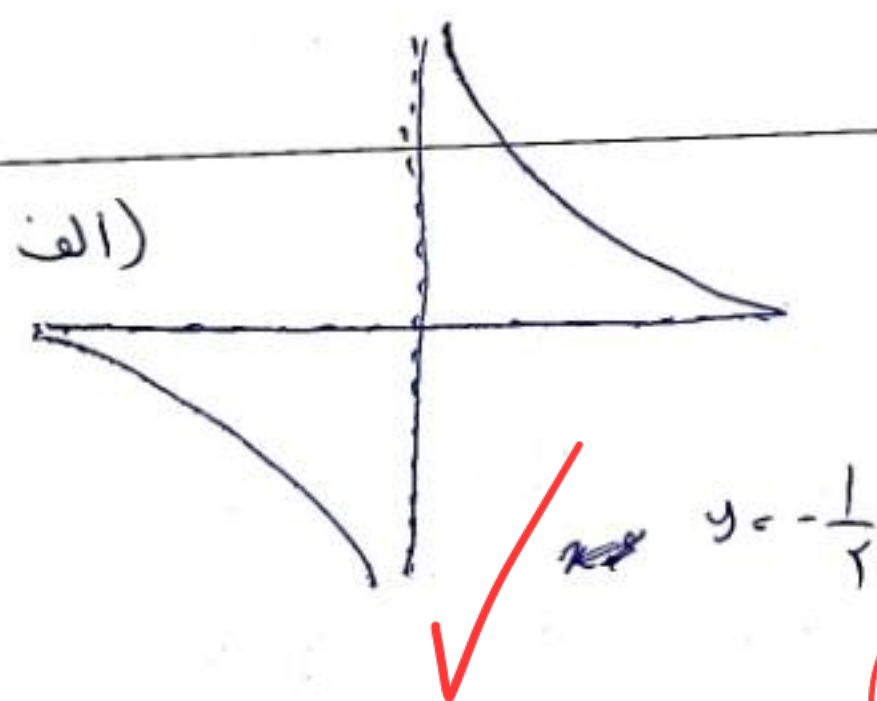
$$R [0, \sqrt{15}] \quad \checkmark$$

$$الف) y = x^3 + 3x^2 + 2x + 1 \quad \mathbb{R} \quad \checkmark$$

$$ب) y = \sqrt{x^3 + 5x^2 + 2x + 1} \Rightarrow \sqrt{\mathbb{R}} [0, +\infty) \quad (2)$$

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

$$ب) \sqrt{\frac{5x+1}{x+2}} \Rightarrow \sqrt{\mathbb{R} - \{2\}} \Rightarrow [0, +\infty) - \{2\} \quad (1)$$

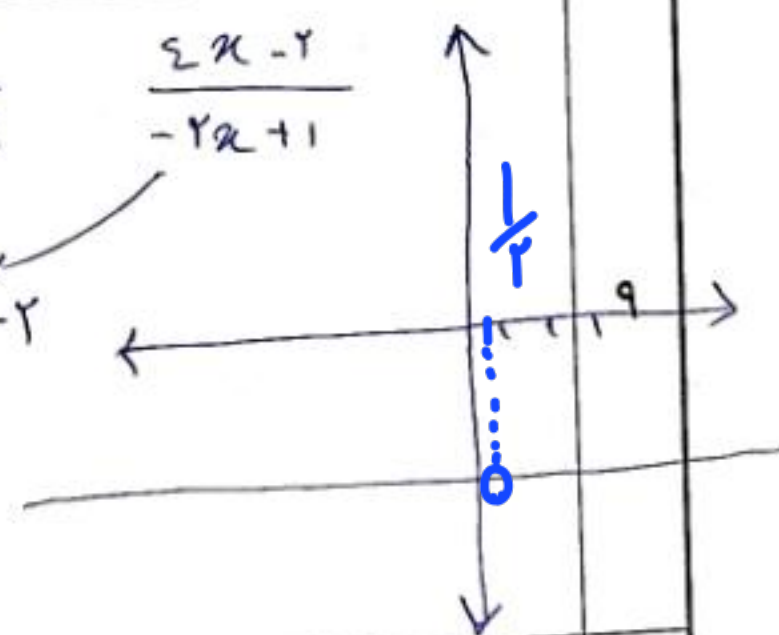


$$y = \frac{5x+1}{x-2}$$

$$ب) y = \frac{5x-2}{1-2x} \quad \frac{5x-2}{-2x+1}$$

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

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



$$الف) y = \cos^2 x + \frac{1}{\cos^2 x} \Rightarrow (0, +\infty) \quad \checkmark$$

$$(1, \infty)$$

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

$$R_f = (-\infty, \sqrt{-1}] \cup [\sqrt{1}, +\infty)$$