

الف) $u^2 = 5 + y$ $u = \pm \sqrt{5 + y}$ $5 + y \geq 0$ $y \geq -5$ $R_f = [-5, +\infty)$

ب) $u^2 = y - 1$ $u = \pm \sqrt{y - 1}$ $R_f = \mathbb{R}$

الف) $y = u^2 - 4u + 4$ $y = (u - 2)^2 + 2$ $(u - 2)^2 = y - 2$

$u = \pm \sqrt{y - 2} + 2$ $y \geq 2$ $R_f = [2, +\infty)$

ب) $y = u^2 - 5u + 1$ $y = (u - \frac{5}{2})^2 - \frac{21}{4}$ $(u - \frac{5}{2})^2 = y + \frac{21}{4}$

$u - \frac{5}{2} = \pm \sqrt{y + \frac{21}{4}}$ $y + \frac{21}{4} \geq 0$ $y \geq -\frac{21}{4}$ $R_f = [-\frac{21}{4}, +\infty)$

الف) $y = \frac{u^2 + 2}{u^2 - 2} = y u^2 - 2y = u^2 + 2$ $y u^2 - u^2 = 2y + 2$
 $u^2(y - 1) = 2y + 2$ $u^2 = \frac{2y + 2}{y - 1}$ $u = \pm \sqrt{\frac{2y + 2}{y - 1}}$ $\frac{2y + 2}{y - 1} \geq 0$
 $R_f = (-\infty, -\frac{2}{3}] \cup [1, +\infty)$ ب) $y |u| - 2 = 2|u| + 1$ $|u|(y - 2) = 5$
 $|u| = \frac{5}{y - 2} \Rightarrow R_f = (2, +\infty)$

$y = \frac{1}{u^2 - 4u}$ $\Rightarrow u^2 - 4u \neq 0$ $u(u - 4) \neq 0$ $u \neq 0$ $u \neq 4$
 $u^2 - 4u = \frac{1}{y}$ $u^2 - 4u - \frac{1}{y} = 0$ $\Delta = (\frac{1}{y})^2 + \frac{4}{y} \geq 0$ $\frac{1}{y^2} + \frac{4}{y} \geq 0$
 $\frac{1 + 4y}{y} \geq 0$ $\frac{1 + 4y}{y} \geq 0$ $\Rightarrow R_f = (-\infty, \frac{1}{4}] \cup (0, +\infty)$

الف) $y = u^2 - 4u + 2 \xrightarrow{u_{min}} \frac{-b}{2a} = \frac{4}{2} = 2 \xrightarrow{y_{min}} -1 \rightarrow R_f = [-1, +\infty)$

ب) $y = -u^2 + 4u + 2 \xrightarrow{u_{max}} \frac{-b}{2a} = \frac{-4}{-2} = 2 \xrightarrow{y_{max}} 6 \rightarrow R_f = (-\infty, 6]$

$$\text{الف) } y = \sqrt{x^2 - 4x + 4} \xrightarrow{x \min} \frac{-b}{2a} = \frac{4}{2} = 2 \xrightarrow{y \min} -V$$

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

$$\text{ب) } y = \sqrt{-x^2 + 4x + 4} \xrightarrow{x \max} \frac{-b}{2a} = \frac{-4}{-2} = 2 \xrightarrow{y \max} 4$$

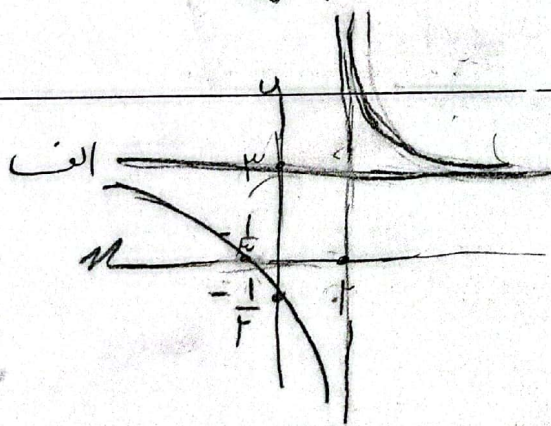
$$R_f = \sqrt{(-\infty, 4]} = R_f = [0, \sqrt{4}]$$

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

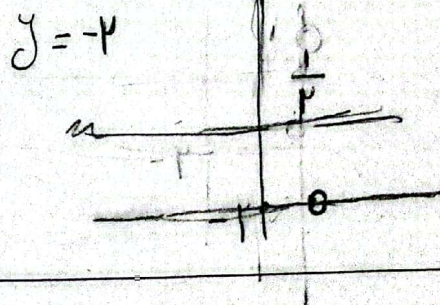
$$\text{ب) } y = \sqrt{x^2 + 4x + 4} \quad R_f = [0, +\infty)$$

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

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



$$\text{ب) } y = \frac{2x-1}{1-x} \Rightarrow x \neq \frac{1}{2}$$



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

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