

$$\text{الف) } y = x^r - a \quad x^r = y + a \quad x = \pm \sqrt[r]{y+a} \quad y \geq -a$$

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

$$\text{ب) } y = x^{r+1} \quad x^{r+1} = y \quad x = \sqrt[r+1]{y}$$

$$R_f = \mathbb{R}$$

$$\text{الف) } y = x^r - rx + r \quad y = (x-r)^r + r \quad x = r \pm \sqrt[r]{y-r} \quad y \geq r$$

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

$$\text{ب) } y = x^r - ax + 1 \quad x^r - ax + 1 = y \Rightarrow \frac{-b \pm \sqrt{\Delta}}{ra} = \frac{a \pm \sqrt{ra - 4fy}}{r}$$

$$R_f = \left[-\frac{r}{f}, +\infty\right)$$

$$fy + r \geq 0 \quad y \geq -\frac{r}{f}$$

$$\text{الف) } y = \frac{x^r + r}{x^r - r} \quad y = \frac{x^r - ry - r}{-y + 1} = \frac{ry + r}{y-1} \quad x = \pm \sqrt[r]{\frac{ry+r}{y-1}}$$

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

$$\begin{array}{c} -\frac{r}{f} \\ + \quad - \quad + \end{array}$$

$$\text{ب) } y = \frac{r|x|+1}{|x|-r} \quad |x| = \frac{-fy-1}{-y+r} = \frac{fy+1}{y-r} \quad \begin{array}{c} -\frac{1}{f} \quad r \\ + \quad - \quad + \end{array}$$

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

خط، صبراً

$$y = \frac{1}{x^2 - 4x} \quad yx^2 - 4yx - 1 = 0 \quad \Delta = 16y^2 + 4y$$

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

$$4y + 1 = 0 \quad y = -\frac{1}{4}$$

$$4y(4y+1) \geq 0$$

$$\frac{-1}{4} \quad 0$$

$$+ \quad - \quad +$$

الف) $y = x^2 - 4x + 2$ $x_{\min} = \frac{-b}{2a} = \frac{4}{2} = 2$

$R_f = [-1, +\infty)$ $y_{\min} = 4 - 16 + 2 = -10$

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

$R_f = (-\infty, 4]$ $y_{\max} = -4 + 16 + 2 = 14$

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

$\Rightarrow \sqrt{[-1, +\infty)}$

$R_f = [0, +\infty)$ $y_{\min} = 4 - 16 + 2 = -10$

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

$\Rightarrow \sqrt{(-\infty, 4]}$

$R_f = [0, \sqrt{14}]$ $y_{\max} = -4 + 16 + 2 = 14$

الف) $y = x^4 + 4x^3 + 4x + 1$ $R_f = \mathbb{R}$

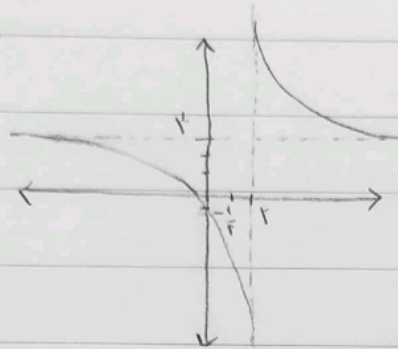
ب) $y = \sqrt{x^4 + 4x^3 + 4x + 1}$ $R_f = [0, +\infty)$

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

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

الف) $y = \frac{x^2 + 1}{x - 2}$



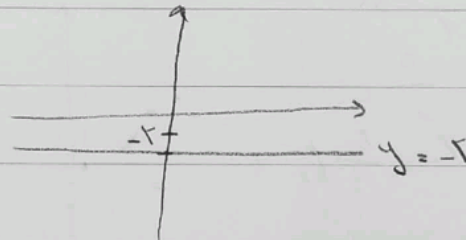
$x = 2$

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$y = \frac{a}{c} = 2$ جانب امی

ب) $y = \frac{2x - 2}{1 - 2x} = -2$



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

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

$R_f: (-\infty, -2] \cup [2, +\infty)$