

الف) $y = x^3 - 2x^2 + 3x$ $y = (x-1)^3 + 1$ $(x-1)^3 = y-1$ $x-1 = \sqrt[3]{y-1}$ اصلی

$x = \sqrt[3]{y-1} + 1$ $y-1 \in \mathbb{R} \Rightarrow R_f = \mathbb{R}$

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

الف) $x^2 - 4x + 10$ $\Rightarrow y = -x^2 + 4x + 10$ درجہ دوم
 $\begin{cases} x_{min} = \frac{-b}{2a} = \frac{2}{-2} = -1 \\ -1 - 1 + 10 = 8 \end{cases}$ $\begin{cases} x_{max} = \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ -4 + 10 + 10 = 16 \end{cases}$ $R_f = (-\infty, 16]$

2) $y = \sqrt{x^2 - 4x + 4}$ $\Rightarrow y = \sqrt{4x - 2x^2} = \sqrt{-x^2 + 4x}$ 2
 $\begin{cases} x_{min} = \frac{-b}{2a} = \frac{2}{-2} = -1 \\ -1 - 1 - 4 = -6 \end{cases}$ $\begin{cases} x_{max} = \frac{-b}{2a} = \frac{2}{-2} = -1 \\ -1 - 1 + 4 = 2 \end{cases}$
 $R_f = [-6, 2] \xrightarrow{\sqrt{\quad}} [0, 2]$

الف) $y = x^3 - 3x^2 + 3x + 1$ $\Rightarrow y = x^3 - 3x^2 + 3x + 1$ درجہ سوم
 $R_f = \mathbb{R}$ $R_f = \mathbb{R}$

2) $y = \sqrt{x^3 - 3x^2 + 3x + 1}$ $\Rightarrow y = (x^3 - 3x^2 + 3x + 1)^{\frac{1}{2}}$ 3
 $R_f = \mathbb{R} \xrightarrow{\sqrt{\quad}} [0, +\infty)$ $R_f = \mathbb{R}$ $R_f = [0, +\infty)$

الف) $y = \frac{3x+1}{x-2}$ $a=3$ $b=1$ $c=1$ $d=-2$ درجہ اول
 $R = \mathbb{R} - \left\{\frac{a}{d}\right\}$ $R = \mathbb{R} - \left\{\frac{3}{-2}\right\}$
 $R_f = \mathbb{R} - \{3\}$ $R_f = \mathbb{R} - \{2\}$

الف) $y = \sqrt{\frac{3x+1}{x+1}}$ $ad \neq bc$ $2 \neq -1$ درجہ اول
 $R = \mathbb{R} - \{2\}$ $R_f = [0, +\infty) - \{2\}$
 $R_f = [0, +\infty)$

