

الف) $x^2 - 4x + 9 = 0$ $\rightarrow x^2 - 4x + 9 = 1$ $\xrightarrow{\text{انتقال به یک طرف}} (x-3)^2 = 1 \rightarrow x-3 = \pm 1$ $\begin{cases} x=2 \\ x=4 \end{cases}$

$x-3-1=0$ $x-3+1=0$
 $x-4=0$ $x-2=0$
 $x=4$ $x=2$

ب) $x^2 + 8x + 15 = 0$ $\rightarrow x^2 + 8x + 15 = 9$ $\xrightarrow{\text{انتقال به یک طرف}} (x+4)^2 = 9 \rightarrow x+4 = \pm 3$ $\begin{cases} x=-1 \\ x=-7 \end{cases}$

$x+4-3=0$ $x+4+3=0$
 $x=-1$ $x=-7$

الف) $x^2 - 5x + 6 = 0 \rightarrow (x-2)(x-3) = 0$ $\begin{cases} x=2 \\ x=3 \end{cases}$

ب) $x^2 - 5x - 14 = 0 \rightarrow (x+2)(x-7) = 0$ $\begin{cases} x=-2 \\ x=7 \end{cases}$

الف) $\frac{a}{a}x^2 - \frac{b}{b}x - \frac{c}{c} = 0 \rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \frac{-(-3) \pm \sqrt{9 - 4 \times 1 \times -5}}{2} = \frac{3 \pm \sqrt{29}}{2}$

$x = \frac{3 + \sqrt{29}}{2}$ $x = \frac{3 - \sqrt{29}}{2}$

ب) $\frac{a}{a}x^2 - \frac{b}{b}x + \frac{1}{c} = 0 \rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \frac{-(-4) \pm \sqrt{16 - 4 \times 1 \times \frac{1}{3}}}{2} = \frac{4 \pm \sqrt{12}}{2}$

$\rightarrow \frac{4 \pm \sqrt{12}}{2} = \frac{2 \pm \sqrt{3}}{1}$ $x = \frac{2 + \sqrt{3}}{1}$ $x = \frac{2 - \sqrt{3}}{1}$

الف) $x^2 - 3x + 2 = 0 \rightarrow (x-1)(x-2) = 0$ $\begin{cases} x=1 \\ x=2 \end{cases}$

جمله مشترک

ب) $4x^2 + x - 3 = 0 \rightarrow x^2 + \frac{1}{4}x - \frac{3}{4} = 0$ $\xrightarrow{\text{جمله مشترک}} (x-3)(x+\frac{1}{4}) = 0$ $\begin{cases} x=\frac{3}{4} \\ x=-\frac{1}{4} \end{cases}$

اوش ac

الف) $5x^2 - 12x + 7 = 0 \rightarrow x^2 - 12x + 35 = 0$ $\xrightarrow{\text{جمله مشترک}} (x-5)(x-7) = 0$ $\begin{cases} x=\frac{5}{5}=1 \\ x=\frac{7}{5} \end{cases}$

ب) $3x^2 - 10x + 7 = 0 \rightarrow x^2 - 10x + \frac{7}{3} = 0$ $\xrightarrow{\text{جمله مشترک}} (x-3)(x-7) = 0$ $\begin{cases} x=\frac{3}{3}=1 \\ x=\frac{7}{3} \end{cases}$

$$\text{الف) } \frac{1}{a}x^2 + \frac{5}{b}x - \frac{1}{c} = 0 \rightarrow \Delta = b^2 - 4ac = 25 - 4(-4)(-1) = 25 - 16 = 9$$

لـ $9 > 0$ ← دو ریشه حقیقی دارد.

$$\text{ب) } \frac{1}{a}x^2 - \frac{12}{b}x + \frac{1}{c} = 0 \rightarrow \Delta = b^2 - 4ac = 1 - 14 = -13 \rightarrow -13 < 0$$

ریشه حقیقی ندارد.

$$\text{ج) } \frac{1}{a}x^2 - \frac{6}{b}x + \frac{1}{c} = 0 \rightarrow \Delta = b^2 - 4ac = 14 = 14 = 0 \rightarrow$$

یک ریشه مضاعف

$$\text{د) } \frac{1}{a}x^2 - \frac{12}{b}x + \frac{1}{c} = 0 \rightarrow \Delta = b^2 - 4ac = 1 - 1 = 0 \rightarrow 0 = 0$$

ریشه حقیقی ندارد.

$$\Delta = 0 \rightarrow \text{یک ریشه مضاعف}$$

$$\Delta < 0 \rightarrow \text{ریشه حقیقی ندارد.}$$

$$\Delta > 0 \rightarrow \text{دو ریشه حقیقی}$$

$$\Delta = b^2 - 4ac$$

$$\Delta = b^2 - 4ac = 9 - 4a$$

$$9 - 4a > 0 \rightarrow -4a > -9 \rightarrow a < \frac{9}{4}$$

$$\left\{ a \in \mathbb{R} \mid a < \frac{9}{4} \right\}$$

$$9 - 4a = 0 \rightarrow -4a = -9 \rightarrow a = \frac{9}{4}$$

$$\Delta = 0 \text{ (ب)}$$

$$9 - 4a < 0 \rightarrow -4a < -9 \rightarrow a > \frac{9}{4}$$

$$\Delta < 0 \text{ (ج)}$$

$$9 - 4a > 0 \rightarrow -4a > -9 \rightarrow a \leq \frac{9}{4} \left\{ a \in \mathbb{R} \mid a \leq \frac{9}{4} \right\}$$

$$\Delta \geq 0 \leftarrow \text{دو ریشه حقیقی}$$

$$\frac{1}{a}x^2 - \frac{3}{b}x + \frac{a}{c} = 0$$

$$\Delta > 0 \text{ (الف)}$$

$$\Delta = 0 \text{ (ب)}$$

$$\Delta < 0 \text{ (ج)}$$

$$y = \frac{1}{a}x^2 + \frac{4}{b}x + \frac{5}{c}$$

$$a > 0 \rightarrow \text{Min}$$

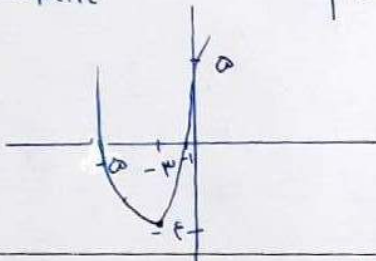
Min

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

$$(-2)^2 + 4(-2) + 5 = -1$$

$$\text{ریشه ها} \rightarrow a + c = b \rightarrow x = -1$$

$$x = \frac{-c}{a} = 5$$



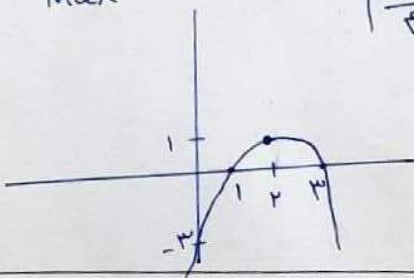
$$y = \frac{1}{a}x^2 + \frac{f}{b}x - \frac{3}{c}$$

$$a < 0 \rightarrow \text{Max}$$

Max

$$\frac{-b}{2a} = \frac{-f}{-2} = \frac{f}{2}$$

$$\frac{-\Delta}{4a} = \frac{-b^2 - 4ac}{-4} = \frac{-f}{-f} = 1$$



$$\text{ب) (ریشه ها)} \rightarrow a + b + c = 0$$

$$x = 1$$

$$x = 3$$

$$\text{در نقاط (1,0), (3,0)}$$

$$\frac{1}{a}x^2 - \frac{3}{b}x - \frac{2}{c} = 0$$

$$S = \frac{-b}{a} = \frac{-(-3)}{1} = 3$$

$$P = \frac{c}{a} = \frac{-2}{1} = -2$$

$$\text{الف) } S^2 - 2P = 9 + 4 = 13$$

$$\text{ب) } S^3 - 3SP = 27 + 12 = 39$$