

$$S(h, k) \Rightarrow y = a(n-h)^2 + k \xRightarrow{A(-1, 9)} y = a(n-(-1))^2 + 9 \quad -1$$

$$\Rightarrow y = a(n+1)^2 + 9 \xRightarrow{B(3, 1)} 1 = a(3+1)^2 + 9 \Rightarrow 1 = 16a + 9 \Rightarrow a = -\frac{1}{4}$$

$$\Rightarrow y = -\frac{1}{4}(n+1)^2 + 9 \Rightarrow y = -\frac{1}{4}n^2 - \frac{1}{2}n + \frac{17}{4}$$

$$2x^2 + mx + m + 4 = 0 \xRightarrow{\Delta > 0} m^2 - 4(2)(m+4) > 0 \Rightarrow (m-12)(m+8) > 0$$

$$S > 0 \Rightarrow -\frac{b}{a} > 0 \Rightarrow -\frac{m}{2} > 0 \Rightarrow m < 0$$

$$P > 0 \Rightarrow \frac{c}{a} > 0 \Rightarrow \frac{m+4}{2} > 0 \Rightarrow m > -4$$

$$\boxed{-4 < m < 0}$$

$$P = \frac{2-m}{2}$$

$$S = -\frac{2m-1}{2} = \frac{1-2m}{2}$$

$$\alpha + \beta = \frac{1}{\alpha\beta}$$

$$2x^2 + (2m-1)x + 2-m = 0$$

$$\Delta = 1 - 4(2-m) = 1 - 8 + 8m = 8m - 7$$

$$= 12m - 24$$

$$\Delta > 0 \Rightarrow \begin{cases} m = \frac{7}{8} \Rightarrow \Delta > 0 \\ m = 0 - 1 \Rightarrow \Delta < 0 \end{cases}$$

$$(2m-1)(m+1) = 0 \Rightarrow \begin{cases} m = -1 \\ m = \frac{1}{2} \end{cases}$$

$$x^2 - 2x - 1 = 0 \Rightarrow \begin{cases} S = 1 \\ P = -1 \end{cases}$$

$$x^2 - 2x + P = y \Rightarrow (x_1^2 + x_2^2 + \frac{1}{x_1} + \frac{1}{x_2})x + (x_1^2 x_2^2 + \frac{1}{x_1 x_2} + x_1^2 + x_2^2)$$

$$\Rightarrow y = x^2 - (S^2 - 2PS + \frac{S}{P})x + (P^2 + \frac{1}{P} + S^2 - 2P)$$

$$\Rightarrow y = x^2 - (1 + 12 - \frac{1}{2})x + (4 - \frac{1}{2} + 1 + 1) \Rightarrow y = x^2 - \frac{21}{2}x + \frac{9}{2}$$

$$t = \sqrt[3]{n} \Rightarrow (t^3 + \frac{1}{t^3} + 1)(t^3 - 1) = t^6 - \frac{1}{t^6} \Rightarrow t^6 - \frac{1}{t^6} = 2 + t^6$$

$$x + t^3 + 1 = 2 + t^3 \Rightarrow t^6 - 2t^3 - 1 = 0 \Rightarrow S = -\frac{2}{1} = \boxed{2}$$

$$\begin{aligned}
 & \alpha + \beta = \frac{1}{\gamma} \leftarrow \alpha = \gamma \leftarrow \beta = \frac{\gamma}{\gamma} \\
 & \alpha + \beta = -\frac{1}{\gamma} \leftarrow \alpha = -\gamma \leftarrow \beta = -\frac{\gamma}{\gamma} \\
 & \alpha = \gamma (\alpha + \beta = \pm 1) \\
 & \alpha_1 = 1 \\
 & \alpha_2 = -1 \\
 & \alpha_1 - \alpha_2 = \boxed{14}
 \end{aligned}$$

$$\begin{aligned}
 y &= \alpha n^2 + (\gamma + \gamma \alpha) n \\
 & a > 0 \quad \alpha \gamma \beta > 0 \Rightarrow \frac{-\gamma + \gamma \alpha}{a} > 0 \\
 & (-\infty, -\frac{\gamma}{\gamma}) \cup (0, +\infty) = a \\
 & \frac{0}{-} + \frac{+\gamma}{+} -
 \end{aligned}$$

$$\begin{aligned}
 & n_1 = -\frac{a}{\gamma} \\
 & n_2 = -\frac{\gamma}{-\gamma} = -1 \\
 & \begin{cases} y_1 = n^2 + a n - \gamma \\ y_2 = -n^2 - \gamma n + b \end{cases} \\
 & y_1 = n^2 + a n - \gamma \quad y_2 = -n^2 - \gamma n + b \\
 & n_1 = n_2 \Rightarrow -\frac{a}{\gamma} = -1 \Rightarrow a = \gamma \\
 & y = n^2 + a n - \gamma \quad y = -n^2 - \gamma n + b \\
 & 1 = -(1)^2 - \gamma \times 1 + b \Rightarrow b = \gamma \\
 & a b = \gamma \times \gamma = \boxed{1} \\
 & n^2 + \gamma n - \gamma = 0 \\
 & (n + \gamma)(n - 1) = 0 \Rightarrow n = 1 \text{ or } n = -\gamma
 \end{aligned}$$

$$\begin{aligned}
 & \alpha \gamma \beta \text{ های مثبت} \\
 & \gamma n^2 - a n + b = 0 \\
 & \gamma a n^2 + a n - \gamma \\
 & \alpha' \gamma \beta' \text{ های مثبت} \\
 & \alpha + \beta = \alpha' + \beta' + 1 \rightarrow \frac{\alpha}{\gamma} = \frac{-\alpha}{\gamma \alpha} + 1 = \frac{1}{\gamma} \rightarrow \frac{\alpha}{\alpha} = 1 \\
 & s_1 = \frac{a}{\gamma} = \frac{1}{\gamma} \\
 & p_1 = \frac{b}{\gamma} \\
 & s_2 = -\frac{1}{\gamma} \\
 & p_2 = -\frac{\gamma}{a} = -\gamma \\
 & (\alpha + \frac{1}{\gamma})(\beta + \frac{1}{\gamma}) = p_2 + \frac{1}{\gamma} s_2 + \frac{1}{\gamma} \\
 & \frac{b}{\gamma} = -\gamma + \frac{1}{\gamma}(-\frac{1}{\gamma}) + \frac{1}{\gamma} = -\gamma \Rightarrow b = -\gamma \\
 & \left[\frac{a}{\gamma} \frac{b}{\gamma} \right] = [-1, 1] = \boxed{-2}
 \end{aligned}$$

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$$\left. \begin{aligned} y_1 &= x^2 + 4x + m = 0 \\ y_2 &= x^2 + 2x - 3m = 0 \end{aligned} \right\} \begin{array}{l} \text{یک ریشه مشترک} \\ \text{مستترک غیر صفر} \end{array} \Rightarrow \begin{aligned} &= \alpha \\ &x^2 + 4x + m = x^2 + 2x - 3m \end{aligned}$$

$$2x + 4m = 0 \Rightarrow x = -2m$$

$$(-2m)^2 + 4m + m = 0 \Rightarrow m^2 - 5m = 0 \Rightarrow m = 0 \text{ } \times$$

$$m = 5 \text{ } \checkmark$$

$$\begin{aligned} y_1 &= x^2 + 4x + 5 = 0 \\ &\rightarrow x = -1 \text{ (circled)} \\ &\quad x = -5 \\ y_2 &= x^2 + 2x - 15 = 0 \\ &\rightarrow x = -5 \\ &\quad x = +3 \text{ (circled)} \end{aligned}$$

ریشه های غیر مشترک $\Rightarrow 3-1=2$
 اختلافشان $3 - (-1) = 4$ (circled)