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نام و نام خانوادگی .....نیلیا حیات طوسی..... پاسخنامه تشریحی تکلیف شماره ۲۳ کلاس ...دهم دختر C پنجشنبه...

۱ (۲)

$y = a(x+1)^2 + 9 \qquad S(-1, 9)$

$(3,1) \Rightarrow 16a + 9 = 1 \Rightarrow 16a = -8 \qquad a = \frac{-1}{2}$

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

۲ (۲)

$\Delta > 0 \Rightarrow m^2 - 8m - 48 > 0$

$m = \frac{8 \pm \sqrt{64 + 192}}{2} \to 12, -4$

$+ \quad -4 \quad - \quad 12 \quad +$

$m < -4 \quad | \quad m > 12$

$\frac{c}{a} > 0 \Rightarrow \frac{m+6}{2} > 0 \qquad m + 6 > 0 \qquad m > -6$

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

ج: $\boxed{(-6, -4)}$

۳ (۲)

$\Delta > 0$

$S = \frac{1}{P} \Rightarrow SP = 1 \Rightarrow \frac{-2m+1}{3} \times \frac{2-m}{3} = 1 \qquad -4m + 2m^2 + 2 - m = 9$

$2m^2 - 5m - 7 = 0$

$m = \frac{5 \pm \sqrt{25 + 56}}{4} \to 3.5, -1$

$m = -1 \Rightarrow 3x^2 - 3x + 3 = 0$

$x^2 - x + 1 = 0$

$\Delta = 1 - 4 = -3 < 0$ ✗

$m = 3.5 \Rightarrow 3x^2 + 6x - 1.5 = 0$

$\Delta = 36 + 18 = 54 > 0$ ✓

$\Rightarrow \boxed{m = 3.5}$

۴ (۲)

$x^2 - x - 4 = 0$

$S = x_1 + x_2 = 1$

$P = x_1 \times x_2 = -4$

$S' = x_1^3 + \frac{1}{x_2} + x_2^3 + \frac{1}{x_1} = S^3 - 3SP + \frac{S}{P} = 1 + 12 - \frac{1}{4} = \frac{51}{4}$

$P' = (x_1^3 + \frac{1}{x_2})(x_2^3 + \frac{1}{x_1}) = P^3 + \underbrace{x_1^2 + x_2^2}_{S^2 - 2P} + \frac{1}{P} = -64 + 1 + 8 - \frac{1}{4} = \frac{-221}{4}$

$\Rightarrow y = x^2 - Sx + P \Rightarrow y = x^2 - \frac{51}{4}x - \frac{221}{4}$

$\Rightarrow \boxed{y = 4x^2 - 51x - 221}$

۵ (۲)

$x\sqrt[3]{x} - \sqrt[3]{x^2} + 1 - \frac{1}{\sqrt[3]{x^2}} + \sqrt[3]{x^2} - 1 = 2\sqrt[3]{x}$

$x\sqrt[3]{x} - \frac{1}{\sqrt[3]{x^2}} = 2\sqrt[3]{x} \Rightarrow x^2 - 1 = 2x$

$x^2 - 2x - 1 = 0 \qquad x_1 + x_2 = \boxed{2}$

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$3\alpha = \beta \qquad 3\alpha^2 - a\alpha + 4 = 0$

$27\alpha^2 - 3\alpha a + 4 = 0$

$S = 3\alpha + \alpha = 4\alpha = \frac{a}{3} \qquad \alpha = \frac{a}{12}$

$P = 3\alpha^2 = \frac{4}{3} \qquad \alpha^2 = \frac{4}{9} \qquad \alpha = \pm\frac{2}{3}$

$\Rightarrow \frac{a}{12} = \frac{2}{3} \qquad \frac{a}{12} = \frac{-2}{3}$

$a_1 = 8 \qquad a_2 = -8 \quad \Rightarrow a_1 - a_2 = \boxed{16}$

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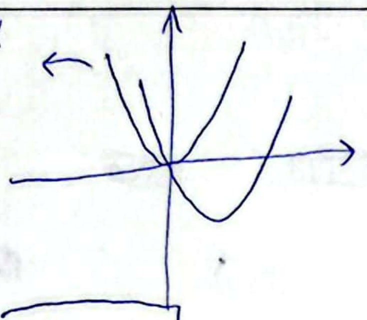
$y = x^2$, ~~$a=1$~~, ~~$a = \frac{-3}{2}$~~



$a > 0$

$\Delta > 0 \quad (3+2a)^2 > 0 \rightarrow R - \{\frac{-3}{2}\}$

$S > 0 \quad \frac{-3-2a}{a} > 0 \qquad \frac{-3}{2} \quad 0 \qquad - \; + \; - \qquad (\frac{-3}{2}, 0)$

$P = 0$ ✓

⇒ به ازای هیچ مقدار a ... [illegible]

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$\frac{-a}{2} = \frac{2}{-2} \qquad a = 2 \qquad y = 1 \Rightarrow y = x^2 + ax - 2$

$x^2 + 2x - 2 = 1$

$x^2 + 2x - 3 = 0$

$(x+3)(x-1) = 0 \qquad x = -3, \; x = 1$

$y = 1$

$\Rightarrow -x^2 - 2x + b = 1$

$-9 + 6 + b = 1 \Rightarrow b = 4$

$ab = \boxed{8}$

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$2x^2 - ax + b = 0 \qquad \alpha + \frac{1}{2} + \beta + \frac{1}{2} = \frac{-a}{2} + 1 = \frac{a}{2} \qquad a = 1$

$(\alpha + \frac{1}{2})(\beta + \frac{1}{2}) = \alpha\beta + \frac{1}{2}(\alpha+\beta) + \frac{1}{4} = \frac{b}{2}$

$2ax^2 + ax - 6 = 0 \qquad \alpha + \beta = \frac{-a}{2} \qquad \alpha\beta = -3$

$-3 + (\frac{-1}{4}) + \frac{1}{4} = \frac{b}{2}$

$b = -6$

$[\frac{ab}{4}] = \boxed{-2}$

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$\left.\begin{array}{l}\alpha + \beta = -6 \\ \alpha + \theta = -2\end{array}\right\} \theta - \beta = \boxed{4}$