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(۱)

الف) $y = 2x^2 - 4x + 1$

ext min $\begin{cases} \frac{-b}{2a} \to \frac{4}{4} = 1 \\ \underset{x=1}{\text{جایگذاری}} \to 2-4+1 = -1 \end{cases}$

ب) $y = -2x^2 + 3x - 5$

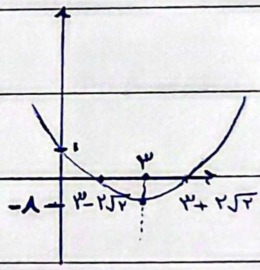
ext max $\begin{cases} \frac{-b}{2a} \to \frac{-3}{-4} = \frac{3}{4} \\ \underset{x=\frac{3}{4}}{\text{جایگذاری}} \to -2\left(\frac{9}{16}\right) + \frac{9}{4} - 5 = \frac{-31}{8} \end{cases}$

(۲)

الف) $y = x^2 - 6x + 1$

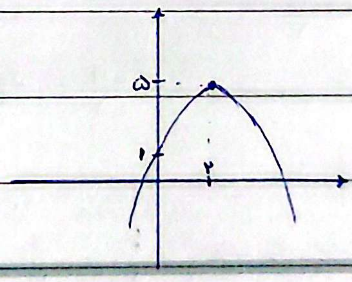
min

$x \begin{cases} 3+2\sqrt{2} \\ 3-2\sqrt{2} \end{cases}$



ب) $y = -x^2 + 4x + 1$

max



(۳)

$\alpha = \frac{-2}{\beta}$ و $\alpha + \beta = 1 \to \frac{-2}{\beta} + \beta = 1 \to \beta^2 - \beta - 2 = 0$

$\beta \begin{cases} 2 \\ -1 \end{cases}$

جایگذاری

-1 یا 2 $\longrightarrow 4(-1)^3 + k - 9(-1) - 2 = 0$

$\boxed{k = -3}$

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④

$S = \alpha + \beta = 3m$

$P = \alpha\beta = m$　$\Longrightarrow \sqrt{\alpha} - \sqrt{\beta} = 1$

$(\sqrt{\alpha} - \sqrt{\beta})^2 = 1 \rightarrow \underbrace{\alpha + \beta}_{3m} - 2\sqrt{\underbrace{\alpha\beta}_{m}} = 1$

$3m - 2\sqrt{m} - 1 = 0$

$\sqrt{m} = t \rightarrow 3t^2 - 2t - 1 = 0$

$t = \boxed{1 \checkmark}$, $-\frac{1}{3}$ ✗

$\boxed{t = 1 \rightarrow m = 1}$

حاصل ضرب ریشه ها $\Longrightarrow 2x^2 - x - 1 = 0$　$x = 1 , -\frac{1}{2}$　$\rightarrow \boxed{P = \frac{-1}{2}}$

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⑤

مساحت مثلث : $\frac{h \times a}{2} = \frac{3}{4} \longrightarrow ha = \frac{3}{2}$

محور y را قطع کند : $h \Rightarrow x = 0 \rightarrow y = \boxed{m}$

اختلاف ریشه ها $= \frac{\sqrt{\Delta}}{|a|} \Longrightarrow \frac{\sqrt{(m+2)^2}}{2} = \boxed{\frac{m+2}{2}}$

$ha = (m)\left(\frac{m+2}{2}\right) = \frac{3}{2}$

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

$m = 1 , -3$

$y = x^2 - x + 1 \longrightarrow \frac{-b}{2a} = \boxed{\frac{1}{2}}$

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

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⑥

کمترین مقدار سهمی $= y_{min} = \dfrac{-(9-4a^2)}{4a} = \dfrac{7}{8}$

$8a^2 - 7a - 18 = 0 \longrightarrow \Delta = 49 + 8(18) = 625$

$a = \dfrac{7 \pm 25}{16} = \begin{cases} 2 \\ \dfrac{-18}{16} = \dfrac{-9}{8} \end{cases}$ ← دو مقدار

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⑦

معادله اول : ریشه‌ها → $2k+1$ و $2k+3$ → $P_1 = 4k^2 + 8k + 3$

معادله دوم : ریشه‌ها → $2k$ و $2k+2$ → $P_2 = 4k^2 + 4k$

$P_1 - P_2 = +8k + 3 - 4k = \boxed{4k+3}$

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⑧

$$\begin{cases} y = -ax^2 + ax + 2 \longrightarrow x_{\text{راس}} = \dfrac{-a}{-2} = \dfrac{1}{2} \ / \ y_{\text{راس}} = 2 + \dfrac{a}{4} \\ y = 2bx^2 - bx - 1 \longrightarrow x_{\text{راس}} = \dfrac{b}{4b} = \dfrac{1}{4} \ / \ y_{\text{راس}} = \dfrac{-b}{8} - 1 \end{cases}$$

جایگذاری

$-a\left(\dfrac{1}{4}\right)^2 + \dfrac{a}{4} + 2 = \dfrac{-b}{8} - 1 \longrightarrow \dfrac{3a}{16} + 2 = \dfrac{-b}{8} - 1$

$2b\left(\dfrac{1}{2}\right)^2 - \dfrac{b}{2} - 1 = 2 + \dfrac{a}{2} \longrightarrow -1 = 2 + \dfrac{a}{4} \rightarrow \boxed{a = -12}$

و $\boxed{b = -6}$

$b - a = -6 + 12 = \boxed{6}$

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(9)

$$\alpha\beta = \frac{\beta}{25\alpha} = \alpha^2 = \frac{1}{25} \longrightarrow \alpha = \boxed{\frac{\pm 1}{5}}$$

$$x = \alpha \longrightarrow 25\alpha \times \frac{1}{25} + 4\alpha + \beta = 0 \longrightarrow 5\alpha + \beta = 0$$

$$\beta > \alpha \longrightarrow \begin{cases} \beta = 1 \\ \alpha = -\frac{1}{5} \end{cases}$$

(10)

$$S = a + b = a^2 + b^2 - 12 \longrightarrow S = S^2 - 2P - 12$$

$$P = a.b = a + b - 1 \longrightarrow P = S - 1$$

$$S^2 - 2S + 2 - S - 12 = 0$$

$$S^2 - 3S - 10 = 0$$

$$(S-5)(S+2) = 0$$

$$S \begin{cases} -2 \ ✗ \\ 5 \ ✓ \end{cases}$$

چون گفته اعداد طبیعی.