۱- $x_s = \frac{-b}{2a} = 2 \longrightarrow \frac{-1}{2a-2} = 2 \Rightarrow a = \frac{2}{4} \Rightarrow y = \frac{-x^2}{4} + x + 2 \quad z = -x^2 + 4x + 12$

$-x^2 + 4x + 12 = 0 \longrightarrow x^2 - 4x - 12 = 0 \Rightarrow x = \begin{cases} 6 \checkmark \\ -2 \end{cases}$

۲- $\Delta > 0 \Rightarrow 25 - 4m^2 > 0 \Rightarrow m^2 < \frac{25}{4} \Rightarrow -\frac{5}{2} < m < \frac{5}{2}$ (I)

$a < 0 \Rightarrow m < 0$ (II)

(I) $\cap$ (II) $\longrightarrow m \in (-\frac{5}{2}, 0)$

۳- $x^2 - Sx + P = 0$

$x^2 - \left(\frac{2-\sqrt{5}}{2} + \frac{2+\sqrt{5}}{2}\right)x + \left(\frac{2+\sqrt{5}}{2} \times \frac{2-\sqrt{5}}{2}\right) = x^2 + 2x + \frac{4}{4}$

۴- $2\alpha^2 + \beta^2 = 2\alpha^2 + 2\beta^2 + \alpha^2 - \beta^2 = 2(\alpha^2+\beta^2) + (\alpha-\beta)(\alpha+\beta)$

$= 2(S^2 - 2P) - \left(\frac{\sqrt{\Delta}}{|a|}\right)(S) = 2(14 - (m+1)) - \frac{\sqrt{-8m+48}}{2} \times 4 = 12$

$\Rightarrow 24 - 2m - 4 - 2\sqrt{-8m+48} = 12 \Rightarrow \sqrt{-8m+48} = 8 - m$

$\Rightarrow m^2 - 8m + 16 = 0 \Rightarrow \boxed{m = 4}$

۵- $a = 4k + 9 \Rightarrow k = -1 \Rightarrow y = -(x-2)^2 + 9 = -x^2 + 4x + 5$

$\Rightarrow -x^2 + 4x + 5 > 0$

	-1		5	
	$-$	$+$	$+$	$-$

$\boxed{x \in (-1, 5)}$ $\quad \begin{cases} x = -1 \\ x = 5 \end{cases}$

۶- $\alpha\beta^2 - 7\beta + 9\beta = 0 \Rightarrow \alpha\beta^2 + 2\beta = 0 \rightarrow \beta(\alpha\beta + 2) = 0$

$\alpha^2 - 7\alpha + 9\beta = 0 \xrightarrow{\alpha = \frac{-2}{\beta}} \frac{-8}{\beta^2} + \frac{14}{\beta} + 9\beta = 0 \longrightarrow -8 + 14\beta^2 + 9\beta^3 = 0$

$\Rightarrow \alpha = -\frac{2}{\beta}$

$\beta^2 = t \longrightarrow 9t^2 + 14t - 8 = 0 \Rightarrow t = \begin{cases} \frac{2}{9} \Rightarrow \beta = \frac{2}{3} \\ -4 \end{cases}$

$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{S}{P} = \boxed{\frac{7}{4}}$

۷- $\alpha^2 + m\alpha - 2m = 0 \Rightarrow \alpha^2 = -m\alpha + 2m$

$\beta^2 + m\beta - 2m = 0 \Rightarrow -m\beta = \beta^2 - 2m$

$\alpha^2 - m\beta = 8 \Rightarrow -m\alpha + 2m + \beta^2 - 2m = 8 \Rightarrow -m(\alpha+\beta) + 2m - 2m = 8$

$\Rightarrow m^2 + 2m - 8 = 0 \Rightarrow S = \frac{-b}{a} = \boxed{-2}$

-٨

$y_s = \frac{-\Delta}{4a} = 8 \Rightarrow -\frac{(16 - 4m(\frac{m}{2}+1))}{4m} = 8$

$\Rightarrow 2m^2 + 8m - 16 = 32m \rightarrow 2m^2 - 4m - 16 = 0 \Rightarrow m^2 - 2m - 8 = 0$

$m = \begin{cases} 4 \\ -2 \end{cases}$

$y = -2x^2 + 4x + 9 \rightarrow x = \begin{cases} -1 \\ 3 \end{cases}$

-٩

$y = k(x-2)^2 + 4 \rightarrow 8 = k(-2)^2 + 4 \Rightarrow k = -\frac{1}{2}$

$y = -\frac{(x-2)^2}{2} + 4 = -\frac{x^2}{2} + 2x + 4$

$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta+\alpha}{\alpha\beta} = \frac{S}{P} = -\frac{4}{8} = \boxed{-\frac{1}{2}}$

-١٠

$x = 2 \Rightarrow 4 - 8a - 8 + 2a^2 + 6a + 2 = 0$

$2a^2 - 2a - 12 = 0 \Rightarrow a = \begin{cases} 3 \\ -2 \end{cases}$

$3 \rightarrow x^2 - 8x + 12 = 0 \Rightarrow x = \begin{cases} 6 \\ 2 \end{cases}$

$-2 \rightarrow x^2 - \frac{8}{2} + \frac{4}{2} = 0 \Rightarrow \begin{cases} x = 6 \\ x = 2 \end{cases}$

$\Rightarrow x = 6$