

الف) $y = x^2 + 4x + 5 \rightarrow \min \rightarrow \text{ext}$ $\left| \begin{array}{l} \frac{-b}{2a} = \frac{-4}{2} = -2 \\ 9 - 16 + 5 = y = -1 \end{array} \right. \Rightarrow \begin{bmatrix} -2 \\ -1 \end{bmatrix}$ ✓

عضو از مبدا است



ب)

الف) $y = -x^2 + 4x - 3 \rightarrow \max \rightarrow \text{ext}$ $\left| \begin{array}{l} \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ -4 + 16 - 3 = 9 \end{array} \right. \Rightarrow \begin{bmatrix} 2 \\ 9 \end{bmatrix}$ ✓

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



$\Delta = b^2 - 4ac = 9 - 16a > 0 \rightarrow -16a > -9 \rightarrow a < \frac{9}{16}$

$\Delta = b^2 - 4ac = 9 - 16a = 0 \rightarrow -16a = -9 \rightarrow a = \frac{9}{16}$ ✓

$\Delta = b^2 - 4ac = 9 - 16a < 0 \rightarrow -16a < -9 \rightarrow a > \frac{9}{16}$

$\Delta = 9 - 16a \rightarrow a = 1 \rightarrow \Delta = 1 \rightarrow x = \frac{-(-4) \pm \sqrt{1}}{-2} \Rightarrow x = -2 \text{ یا } x = -1$
 $9 - 16a \geq 0 \rightarrow a \leq \frac{9}{16}$

الف) دو جواب $\Delta = +$

ب) یک ریشه مضاعف $\Delta = 0$

ج) فاقد ریشه حقیقی $\Delta < 0$

د) ریشه دایره باشد ؟

با $\Delta \leq 0$ باشد

الف) $x^2 - 2x - 1 = 0 \xrightarrow{+2} x^2 - 2x + 1 = 2 \rightarrow (x-1)^2 = 2 \rightarrow x-1 = \pm\sqrt{2}$

$\Rightarrow x = \sqrt{2} - 1$ یا $x = -\sqrt{2} - 1$
 $(x-1)^2 = 2 \rightarrow x-1 = \sqrt{2} \rightarrow x = 1 + \sqrt{2}$
 $x-1 = -\sqrt{2} \rightarrow x = 1 - \sqrt{2}$

ب) $x^2 - x - 1 = 0 \xrightarrow{+1} x^2 - x + \frac{1}{4} = 0 \rightarrow (x - \frac{1}{2})^2 = 0 \rightarrow x = \frac{1}{2}$
 $(x^2 - x + \frac{1}{4}) - \frac{1}{4} = -1 \rightarrow (x - \frac{1}{2})^2 = \frac{5}{4} \rightarrow x = \frac{1}{2} + \frac{\sqrt{5}}{2}$ یا $x = \frac{1}{2} - \frac{\sqrt{5}}{2}$

الف) $x^2 - 2x - 1 = 0 \rightarrow \Delta = b^2 - 4ac = 16 \rightarrow x = \frac{2 \pm \sqrt{16}}{2}$ ✓

$\Rightarrow x = \frac{2 + \sqrt{16}}{2}$ یا $x = \frac{2 - \sqrt{16}}{2}$

ب) $x^2 - x - 1 = 0 \rightarrow \Delta = 1 + 4 = 5 \rightarrow x = \frac{1 \pm \sqrt{5}}{2}$
 $\Rightarrow x = \frac{1 + \sqrt{5}}{2}$ یا $x = \frac{1 - \sqrt{5}}{2}$ ✓

الف) $x^2 - 11x + 28 = 0 \rightarrow (x - 4)(x - 7) \Rightarrow \begin{matrix} x = 7 \\ x = 4 \end{matrix}$ ✓ ب) $x^2 + 3x - 28 = 0 \rightarrow (x - 4)(x + 7) \Rightarrow \begin{matrix} x = -7 \\ x = 4 \end{matrix}$ ✓	٦
الف) $5x^2 - 12x + 7 = 0 \rightarrow x^2 - 12x + 14 = 0 \rightarrow (x - 7)(x - 2) \Rightarrow x = \frac{7}{5} \text{ یا } x = \frac{2}{5} = 1$ ✓ ب) $3x^2 - 10x + 7 = 0 \rightarrow x^2 - 10x + 21 = 0 \rightarrow (x - 7)(x - 3) \Rightarrow x = \frac{7}{3} \text{ یا } x = \frac{3}{3} = 1$ ✓	٧
الف) $2x^2 - 5x + 3 = 0 \rightarrow x^2 - 5x + 4 = 0 \rightarrow (x - 2)(x - 3) = 0 \rightarrow x = \frac{2}{2} = 1 \text{ یا } x = \frac{3}{2}$ ✓ ب) $2x^2 + 5x + 3 = 0 \rightarrow x^2 + 5x + 4 = 0 \rightarrow (x + 2)(x + 3) = 0 \rightarrow x = -\frac{2}{2} = -1 \text{ یا } x = -\frac{3}{2}$ ✓ ج) $2x^2 - 5x + 1 = 0 \xrightarrow{\Delta} \Delta = 25 - 8 = 17 \rightarrow x = \frac{5 \pm \sqrt{17}}{4} \rightarrow x = \frac{5 + \sqrt{17}}{4} \text{ یا } x = \frac{5 - \sqrt{17}}{4}$ ✓ د) $4x^2 + 7x + 9 = 0 \xrightarrow{\Delta} \Delta = 49 - 144 \Rightarrow \Delta$ منفی است و معادله جواب ندارد ✓	٨
$S = \frac{-b}{a} = 3$ و $P = \frac{c}{a} = -2$ الف) $S^2 - 2P = 9 + 4 = 13$ ✓ ب) $S^3 - 3SP = 27 + 12 = 39$ ✓	٩
الف) $\binom{9}{5} + \binom{9}{2} = \frac{9!}{5! \times 4!} + \frac{9!}{2! \times 7!} = 21 + 36 = 57$ ✓ ب) $\binom{9}{4} - \binom{8}{2} = \frac{9!}{4! \times 5!} - \frac{8!}{2! \times 6!} = 126 - 28 = 98$ ✓	١٠