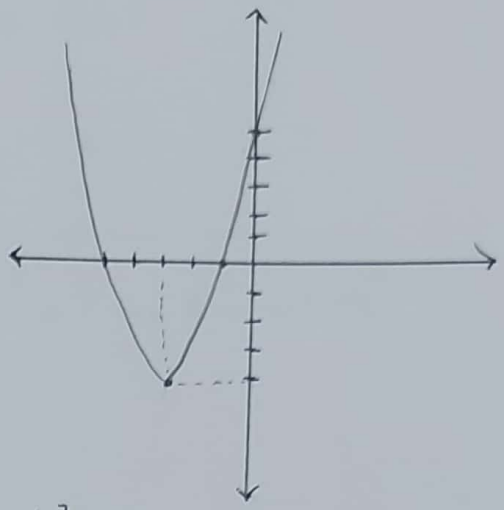
① $y = x^2 + 6x + 5 \xrightarrow{a>0 \text{ چون}} \text{Min}$

$-\frac{\Delta}{4a} \longrightarrow$ عرض سهمی $\quad -\frac{b}{2a} \longrightarrow$ طول سهمی

$\Delta = b^2 - 4ac \quad (6)^2 - 4(1)(5) = 16 = \Delta$

$\frac{-\Delta}{4a} = \frac{-16}{4(1)} = \underbrace{-4}_{\text{عرض سهمی}} \quad \frac{-b}{2a} = \frac{-6}{2(1)} = \underbrace{-3}_{\text{طول سهمی}}$



$y = x^2 + 6x + 5 \xrightarrow{y=0} (x+1)(x+5) \Rightarrow x \nearrow -1 \searrow -5$ } طول از مبدأ

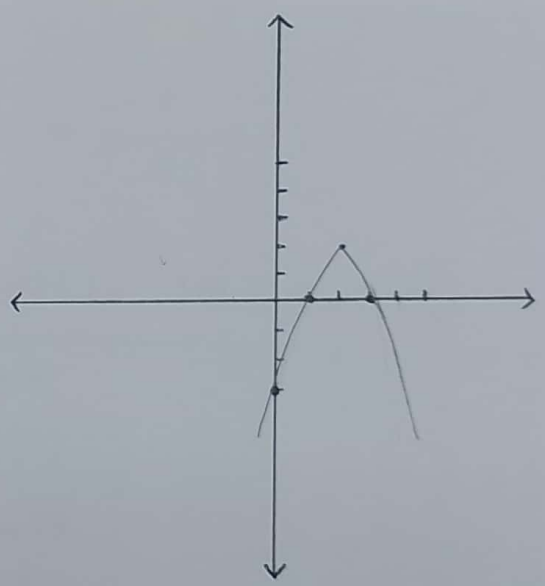
$x=0 \rightarrow y \longrightarrow 5$ } عرض از مبدأ

② $y = -x^2 + 4x - 3 \xrightarrow{a<0} \text{Max}$

$-\frac{\Delta}{4a} \longrightarrow$ عرض سهمی $\quad -\frac{b}{2a} \longrightarrow$ طول سهمی

$\Delta = b^2 - 4ac \quad (4)^2 - 4(-1)(-3) = 4 = \Delta$

$-\frac{4}{4(-1)} = 1$ عرض سهمی $\quad -\frac{4}{2(-1)} = 2$ طول سهمی



$y = -x^2 + 4x - 3 \xrightarrow{y=0} x \nearrow 1 \searrow 3$

$x=0 \rightarrow y = -3$ عرض از مبدأ

③ $2x^2 - 3x + a = 0$ ۲ جواب حقیقی $\longrightarrow \Delta > 0$

(الف) $\Delta > 0 \rightarrow b^2 - 4ac > 0 \longrightarrow 9 - 4(2)\times(a) > 0 \Rightarrow 1 \geq a$

$\Delta = 0 \longrightarrow$ ریشه مضاعف

(ب) $\Delta = 0 \longrightarrow b^2 - 4ac = 0 \longrightarrow 9 - 4(2)\times(a) = 0 \Rightarrow a = \frac{9}{8}$

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③ $2x^2 - 3a + a = 0$

ج) $\Delta < 0 \rightarrow b^2 - 4ac < 0 \rightarrow 9 - 4(2)(a) < 0 \Rightarrow a > 1$

د)

④ الف) $x^2 - 2x - 1 = 0$ $\quad x^2 - 2x + 1 = 2 \rightarrow (x-1)^2 = 2 \rightarrow x - 1 = \pm\sqrt{2}$

$\Rightarrow x \rightarrow 1 + \sqrt{2}$

$\searrow 1 - \sqrt{2}$

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

$\rightarrow x - \frac{1}{2} = \pm\sqrt{\frac{5}{4}} \rightarrow x = \frac{1}{2} \pm \frac{\sqrt{5}}{4} \Rightarrow x \rightarrow \frac{1+\sqrt{5}}{4}$

$\searrow \frac{1-\sqrt{5}}{4}$

⑤ الف) $x^2 - 2x + 1 = 0$ $\quad \Delta = b^2 - 4ac \rightarrow (-2)^2 - 4(1)(1) = 0$

$\frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \frac{-(-2) \pm \sqrt{0}}{2(1)} = \frac{2}{2} = 1$

ب) $x^2 + x + 4 = 0$ $\quad \Delta = b^2 - 4ac \rightarrow (1)^2 - 4(1)(\ ) = -15$ جواب حقیقی ندارد

⑥ الف) $x^2 - 11x + 28 = 0$ $\quad (x-4)(x-7) \Rightarrow x \rightarrow 7$

$\searrow 4$

ب) $x^2 + 3x - 28 = 0$ $\quad (x-4)(x+7) \Rightarrow x \rightarrow -7$

$\searrow 4$

⑦ الف) $5x^2 - 12x + 7 = 0 \rightarrow x^2 - 12x + 35 = 0 \rightarrow (x-7)(x-5) \Rightarrow x \rightarrow \frac{5}{5} = 1$

$\searrow \frac{7}{5}$

ب) $3x^2 - 10x + 7 = 0 \rightarrow x^2 - 10x + 21 = 0 \rightarrow (x-3)(x-7) \Rightarrow x \rightarrow \frac{7}{3}$

$\searrow \frac{3}{3} = 1$

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۸) الف) $2x^2 - 5x + 3 = 0 \longrightarrow x^2 - 5x + 6 = 0 \longrightarrow (x-3)(x-2) = 0 \Rightarrow x \to \frac{2}{2} = 1$ ، $\frac{3}{2}$

ب) $2x^2 + 5x + 3 = 0 \longrightarrow x^2 + 5x + 6 = 0 \longrightarrow (x+3)(x+2) = 0 \Rightarrow x \to -\frac{3}{2}$ ، $-\frac{2}{2} = -1$

ج) $2x^2 - 5x + 1 = 0 \qquad \Delta = b^2 - 4ac \qquad \Delta = 25 - 4(2)(1) = 17$

$$\frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-(-5) \pm \sqrt{17}}{4} \Rightarrow x \nearrow \frac{5+\sqrt{17}}{4} \quad , \quad \searrow \frac{5-\sqrt{17}}{4}$$

د) $4x^2 + 7x + 9 = 0 \qquad 49 - 4 \times (4) \times (9) = -95$

ریشه حقیقی ندارد.

۹) الف) $s^2 - 2p\left(\frac{-(-3)}{1}\right)^2 - 2\left(\frac{-2}{1}\right) = 13$

ب) $s^3 - 3sp\left(\frac{-(-3)}{1}\right)^3 - 3\left(\frac{-(-3)}{1}\right)\left(\frac{-2}{1}\right) = 27$

۱۰) الف) $\binom{7}{5} + \binom{9}{2} = \frac{7!}{5! \times 2!} + \frac{9!}{2! \, 7!} = \frac{7 \times 6}{2} + \frac{9 \times 8}{2} = 21 + 36 = 57$

ب) $\binom{9}{3} - \binom{8}{2} = \frac{9!}{3! \times 6!} + \frac{8!}{2! \times 6!} = \frac{\cancel{7} \times 8 \times \cancel{6}^{3}}{\cancel{7} \times \cancel{2}} + \frac{8 \times 7}{2} = 84 - 28 = 56$

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