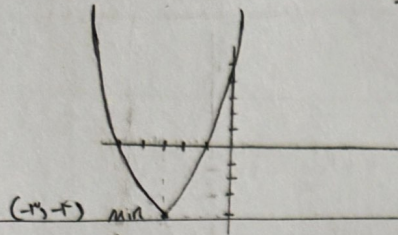


$$\alpha = 1 \quad \begin{matrix} \uparrow \\ y = x^2 + 4x + 3 \end{matrix}$$

$$\text{ext } (M_m) = \begin{cases} -\frac{b}{2a} = -\frac{-4}{2} = -3 \\ \Delta = b^2 - 4ac = 16 - 12 = 4 \Rightarrow \frac{-16}{2} = -8 \end{cases} \Rightarrow \text{Min} = \begin{cases} -3 \\ -8 \end{cases} \quad (\text{الف})$$

$a > 0 \Rightarrow \leftarrow$ (U) $\square \quad \frac{-\Delta}{2a} \quad 1) \quad \Delta = b^2 - 4ac = 16 - 12 = 4 \Rightarrow \frac{-16}{2} = -8$
 $\frac{-\Delta}{2a} \quad 2) \quad 9 - 12 + 3 = -3 \quad (x = -3) \Rightarrow y = -8$

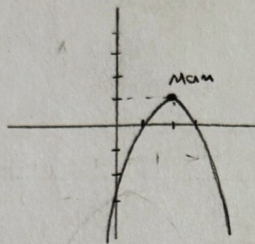


$$y = x^2 + 4x + 3 \rightarrow \text{نقطه اوج یا کمینه}$$

$y = 0$
 $0 = x^2 + 4x + 3 \quad (x+1)(x+3) = 0 \Rightarrow \begin{cases} x = -1 \\ x = -3 \end{cases}$

$$\text{ext} = \begin{cases} -\frac{b}{2a} \\ -\frac{\Delta}{4a} \end{cases} \rightarrow \alpha < 0 \Rightarrow \text{Max}(f) \Rightarrow \text{Max} = \begin{cases} -\frac{f}{-2} = +2 \\ -\frac{f}{-4} = +1 \end{cases}$$

$y = -x^2 + 4x - 3$
 $\Delta = 16 - 4(-1)(-3) = 16 - 12 = 4$ (الف)



نقطه 1، 2: $\begin{cases} 1) \text{ نقطه کمینه} \\ 2) \text{ نقطه اوج} \end{cases}$
 $-x^2 + 4x - 3 = 0 \Rightarrow a + b + c = 0 \Rightarrow \begin{cases} x = 1 \\ x = 3 \end{cases}$

$$2x^2 - 3x + a = 0 \quad (\text{الف}) \Rightarrow \Delta > 0 \Rightarrow \Delta = b^2 - 4ac = 9 - 4(2a) = 9 - 8a > 0$$

$9 - 8a > 0 \Rightarrow -8a > -9 \Rightarrow a < \frac{9}{8}$

ب) $9 - 8a = 0 \Rightarrow a = \frac{9}{8}$
 $-8a = -9 \Rightarrow a = \frac{9}{8}$ (ب) $\Delta = 0 \Rightarrow$ ریشه مضاعف (ریشه مضاعف)

ج) $a > \frac{9}{8} \Rightarrow \Delta < 0 \Rightarrow$ ریشه حقیقی

د) $a < \frac{9}{8} \Rightarrow \Delta > 0 \Rightarrow$ ریشه حقیقی

$$x^2 - 2x - 1 = 0 \Rightarrow x^2 - 2x + 1 = +2 \rightarrow (x-1)^2 = +2 \quad \begin{cases} x-1 = +\sqrt{2} \rightarrow x = \sqrt{2} + 1 \\ x-1 = -\sqrt{2} \rightarrow x = 1 - \sqrt{2} \end{cases}$$

$$x^2 - x - 1 = 0 \Rightarrow (x - \frac{1}{2})^2 = \frac{5}{4} \Rightarrow \begin{cases} x - \frac{1}{2} = +\frac{\sqrt{5}}{2} \Rightarrow x = \frac{\sqrt{5} + 1}{2} \\ x - \frac{1}{2} = -\frac{\sqrt{5}}{2} \Rightarrow x = \frac{1 - \sqrt{5}}{2} \end{cases}$$

$(x^2 - x + \frac{1}{4}) = (x - \frac{1}{2})^2$

الف) $x^2 - 2x - 1 = 0$

$\Delta = b^2 - 4ac = 4 - 4(-1) = +8$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \begin{cases} \frac{2 + \sqrt{8}}{2} = 1 + \sqrt{2} = x \\ \frac{2 - \sqrt{8}}{2} = 1 - \sqrt{2} = x \end{cases}$$

ب) $x^2 + x - 4 = 0$

$\Delta = b^2 - 4ac = 1 - 4(-4) = 1 + 16 = 17$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \begin{cases} \frac{-1 + \sqrt{17}}{2} = x \\ \frac{-1 - \sqrt{17}}{2} = x \end{cases}$$

$$ج) x^2 - 11x + 28 = 0 \rightsquigarrow (x-4)(x-7) = 0 \Rightarrow \begin{cases} 1) x=4 \\ 2) x=7 \end{cases}$$

$$ب) x^2 + 3x - 28 = 0 \rightsquigarrow (x-4)(x+7) = 0 \Rightarrow \begin{cases} x=-7 \\ x=+4 \end{cases}$$

$$ج) \omega x^2 - 12x + 4 = 0 \rightsquigarrow x^2 - 12x + 3\omega = 0 \xrightarrow{\text{مقسوم بر } \omega} (x-4)(x-\omega) = 0 \Rightarrow \begin{cases} x = +4 \\ x = +\frac{4}{\omega} = +1 \end{cases}$$

$$ب) 3x^2 - 10x + 4 = 0 \rightsquigarrow x^2 - 10x + 4 = 0 \xrightarrow{\text{مقسوم بر } 3} (x-3)(x-4) = 0 \Rightarrow \begin{cases} x = \frac{10}{3} = +1 \\ x = \frac{4}{3} \end{cases}$$

$$ج) 2x^2 - 5x + 2 = 0 \quad a+b+c=0 \rightsquigarrow \begin{cases} x=+1 \\ x = \frac{c}{a} = \frac{2}{2} \end{cases}$$

$$ب) 2x^2 + 5x + 2 = 0 \quad a+c=b \rightsquigarrow \begin{cases} x=-1 \\ x = -\frac{c}{a} = -\frac{2}{2} \end{cases}$$

$$ج) 2x^2 - 5x + 1 = 0 \quad \Delta = b^2 - 4ac = 25 - 4 \times 2 = 25 - 8 = 17$$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \begin{cases} \frac{5 + \sqrt{17}}{4} = x \\ \frac{5 - \sqrt{17}}{4} = x \end{cases}$$

$$د) 2x^2 + 7x + 3 = 0$$

$$\Delta = b^2 - 4ac = 49 - (4 \times 7 \times 3) = 49 - 84 = -35 \Rightarrow \Delta < 0 \rightsquigarrow \text{معادله در مجموعه اعداد حقیقی جواب (ریشه) ندارد.}$$

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

$$ج) S^2 - 3P = 4 - 3(-2) = 4 + 6 = +10$$

$$S = -\frac{b}{a} = \frac{3}{1} = +3$$

$$P = \frac{c}{a} = \frac{-2}{1} = -2$$

$$ب) S^2 - 3SP = 25 - 3(+3)(-2) = 25 + 18 = 43$$

$$\text{انتخاب} = \binom{n}{k} = \frac{n!}{k! \times (n-k)!}$$

$$ج) \binom{5}{4} + \binom{4}{3} = \frac{5!}{4! \times 1!} + \frac{4!}{3! \times 1!} = \frac{5 \times 4 \times 3 \times 2 \times 1}{4 \times 3 \times 2 \times 1} + \frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1} = 5 + 4 = 9$$

$$ب) \binom{4}{3} - \binom{1}{2} = \frac{4!}{3! \times 1!} - \frac{1!}{2! \times 4!} = \frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1} - \frac{1 \times 1 \times 1 \times 1}{2 \times 1} = 4 - \frac{1}{2} = \frac{8-1}{2} = \frac{7}{2}$$