

الف) $x^2 - 4x + 1 = 0 \xrightarrow{+1} x^2 - 4x + 4 = 1 \rightarrow (x-2)^2 = 1 \Rightarrow x-2 = \pm 1$
 $\Rightarrow x = \begin{cases} 3 \\ 1 \end{cases}$

ب) $x^2 + 8x + 15 = 0 \xrightarrow{+9} x^2 + 8x + 16 = 9 \Rightarrow (x+4)^2 = 9$
 $\Rightarrow (x+4) = \pm \sqrt{9} = \pm 3 \Rightarrow x = \begin{cases} -1 \\ -7 \end{cases}$

الف) $x^2 - 5x + 4 = 0 \rightarrow (x-2)(x-3) = 0$
 $\Rightarrow x = \begin{cases} 2 \\ 3 \end{cases}$

ب) $x^2 - 5x - 14 = 0 \rightarrow (x+2)(x-7) = 0$
 $\Rightarrow x = \begin{cases} -2 \\ 7 \end{cases}$

الف) $x^2 - 3x - 5 = 0 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow \frac{3 \pm \sqrt{9 - 4(-5)}}{2} = \frac{3 \pm \sqrt{29}}{2}$

ب) $2x^2 - 4x + \frac{1}{2} = 0 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow \frac{2 \pm \sqrt{16 - 2}}{4} = \frac{2 \pm \sqrt{14}}{4}$

الف) $x^2 - 3x + 2 = 0 \rightarrow \frac{a+b+c=0}{a+c=b} \Rightarrow x = \begin{cases} +1 \\ +2 \end{cases}$

ب) $4x^2 + x - 3 = 0 \rightarrow a+c=b \Rightarrow x = \begin{cases} -1 \\ -\frac{3}{4} \end{cases}$

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

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

الف) $-3x^2 + 5x - 1 = 0 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow 25 - 4(-1 \times 3) = 17$
 $\rightarrow \Delta > 0 \Rightarrow$ ۲ ریشه
 ب) $2x^2 - x + 2 = 0 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow 1 - 4(2 \times 2) = -15$
 $\rightarrow \Delta < 0 \Rightarrow$ ریشه حقیقی ندارد
 ج) $2x^2 - 4x + 2 = 0 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow 16 - 4(2) = 0 \Rightarrow \Delta = 0 \rightarrow$ ۱ ریشه مضاعف
 د) $2x^2 - x + 1 = 0 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow 1 - 4(2) = -7 \Rightarrow \Delta < 0 \Rightarrow$ ریشه حقیقی ندارد

الف) $2x^2 - 3x + a = 0 \rightarrow \frac{b^2 - 4ac}{4a} = 0 \Rightarrow a = 1 \rightarrow x = \frac{1}{2}$
 ب) $\frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \Delta = 0 \rightarrow \frac{b^2 - 4ac}{4a} = 0 \Rightarrow a = \frac{9}{4}$
 ج) $\frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \Delta < 0 \Rightarrow \frac{b^2 - 4ac}{4a} < 0 \Rightarrow a > \frac{9}{4}$
 د) $\frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \frac{b^2 - 4ac}{4a} \rightarrow a < \frac{9}{4}$

الف) $x^2 + 4x + 5 \rightarrow \min$ $\left| \begin{array}{l} -\frac{b}{2a} = -\frac{4}{2} = -2 \\ -\frac{\Delta}{4a} = -\frac{16 - 20}{4} = 1 \end{array} \right|$

 ب)

الف) $-x^2 + 4x - 3 \rightarrow \max$ $\left| \begin{array}{l} -\frac{b}{2a} = -\frac{4}{-2} = 2 \\ -\frac{\Delta}{4a} = -\frac{16 - 12}{-4} = 1 \end{array} \right|$

 ب) نقاط ۱ و ۲

الف) $S^2 - 2P = \frac{b^2}{a^2} - \frac{2c}{a} = \frac{b^2 - 4ac}{a^2} = \frac{9 - 12}{1} = -3$
 ب) $S^3 - 3SP = \frac{-b^3}{a^3} - \left(3x - \frac{b}{a} \times \frac{c}{a} \right) = \frac{-b^3 + 3abc}{a^3}$
 $= \frac{-27 + 3 \times 4}{1} = -9$