

الف) $y = 0x^2 + 2x + 5 \Rightarrow \min$
 طولی استریم: $\frac{-b}{2a} = \frac{-2}{2 \times 1} = -1$
 عرضی استریم: $y = (-1)^2 + 2(-1) + 5 = 1 - 2 + 5 = 4$
 نقاط استریم: $\left\{ \begin{array}{l} -2 \\ -4 \end{array} \right\}$

ب) عرض از مبدأ

الف) $y = -x^2 + 4x - 3 \Rightarrow \max$
 $x = \frac{-b}{2a} = \frac{-4}{2 \times (-1)} = 2$
 $y = -(2)^2 + 4(2) - 3 = -4 + 8 - 3 = 1$
 نقاط استریم: $\left\{ \begin{array}{l} 2 \\ 1 \end{array} \right\}$

ب) عرض از مبدأ

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

$\Delta = b^2 - 4ac = (-3)^2 - 4(2)(a) = 9 - 1(a)$
 الف) $a = -1 \Rightarrow \Delta = 9 - 1(-1) = 10 \Rightarrow x = \frac{3 \pm \sqrt{10}}{2}$
 دارای دو ریشه حقیقی
 ب) $a = \frac{9}{1} \Rightarrow \Delta = 9 - 1\left(\frac{9}{1}\right) = 0 \Rightarrow x = \frac{3 \pm \sqrt{0}}{2} = \frac{3}{2}$
 دارای یک ریشه
 ج) $a = 2 \Rightarrow \Delta = 9 - 1(2) = 7 \Rightarrow$
 فاقد ریشه حقیقی
 د) $a = 1 \Rightarrow \Delta = 9 - 1(1) = 8 \Rightarrow x = \frac{3 \pm \sqrt{8}}{2}$
 معادله دارای ریشه است (۲ ریشه دارد)

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

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

الف) $x^2 - 2x - 1 = 0 \Rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-(-2) \pm \sqrt{4 - (-4)}}{2 \times 1} = \frac{2 \pm \sqrt{8}}{2} = \frac{2 \pm 2\sqrt{2}}{2} = 1 \pm \sqrt{2}$

ب) $x^2 + x - 4 = 0 \Rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-1 \pm \sqrt{1 - (-16)}}{2 \times 1} = \frac{-1 \pm \sqrt{17}}{2}$

$$\text{الف) } x^2 - 11x + 18 = 0 \Rightarrow (x-5)(x-7) = 0 \Rightarrow x \begin{cases} 5 \\ 7 \end{cases}$$

$$\text{ب) } x^2 + 3x - 18 = 0 \Rightarrow (x+6)(x-3) = 0 \Rightarrow x \begin{cases} -6 \\ 3 \end{cases}$$

$$\text{الف) } \omega x^2 - 12x + 7 = 0 \Rightarrow x^2 - 12x + 7 \times \omega = 0 \Rightarrow (x-7)(x-\omega) = 0 \Rightarrow x \begin{cases} \frac{7}{\omega} \\ \omega = 1 \end{cases}$$

$$\text{ب) } 3x^2 - 10x + 7 = 0 \Rightarrow x^2 - 10x + \frac{10}{3}x + 7 = 0 \Rightarrow (x-3)(x-7) = 0 \Rightarrow x \begin{cases} \frac{7}{3} = 1 \\ \frac{7}{3} \end{cases}$$

$$\text{الف) } 2x^2 - 5x + 3 = 0 \Rightarrow x^2 - 5x + 3 \times \frac{2}{2} = 0 \Rightarrow (x-2)(x-3) = 0 \Rightarrow x \begin{cases} \frac{3}{2} = 1 \\ \frac{3}{2} \end{cases}$$

$$\text{ب) } 2x^2 + 5x + 3 = 0 \Rightarrow x^2 + 5x + 3 \times \frac{2}{2} = 0 \Rightarrow (x+2)(x+3) = 0 \Rightarrow x \begin{cases} \frac{3}{2} = -1 \\ \frac{3}{2} \end{cases}$$

$$\text{ج) } 2x^2 - 5x + 1 = 0 \Rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-(-5) \pm \sqrt{25 - 4}}{2 \times 2} = \frac{5 \pm \sqrt{17}}{4}$$

$$\text{د) } 5x^2 + 7x + 9 = 0 \Rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-7 \pm \sqrt{49 - 180}}{10} = \frac{-7 \pm \sqrt{-131}}{10} \Rightarrow \Delta = -131 = \text{فاقد ریشه حقیقی}$$

$$S = \frac{-b}{a}, P = \frac{c}{a}$$

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

$$\text{الف) } S - 2P = \left(\frac{-(-3)}{1} \right) - 2 \left(\frac{-2}{1} \right) = 9 + 4 = 13$$

$$\text{ب) } S^3 - 3SP = 3^3 - 3(3)(-2) = 27 + 18 = 45$$

$$\text{الف) } \begin{pmatrix} 1 \\ \omega \end{pmatrix} = \begin{pmatrix} 1 \\ \omega \end{pmatrix} \begin{pmatrix} 1 \\ \omega \end{pmatrix} + \begin{pmatrix} 9 \\ 2 \end{pmatrix} = \frac{1 \times 1}{1 \times 1} + \frac{9 \times \omega}{1 \times 1} = 1 + 9\omega = \omega^2$$

$$\text{ب) } \begin{pmatrix} 9 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ \omega \end{pmatrix} = \frac{9 \times \omega}{1 \times 1} - \frac{1 \times \omega}{1 \times 1} = 9\omega - \omega = 8\omega$$