

الف) $x^2 - 5x - 6 = 0 \Rightarrow x^2 - 5x - 6 = 0 \Rightarrow (x-6)(x+1) = 0 \Rightarrow$

$$\begin{array}{l} 1) \frac{q}{p} = \frac{3}{1} \\ 2) \frac{-c}{p} = \frac{-2}{3} \end{array}$$

ب) $3x^2 - 11x - 3 = 0 \Rightarrow x^2 - 11x - 9 = 0 \Rightarrow (x-9)(x+1) = 0 \Rightarrow$

$$\begin{array}{l} 1) \frac{q}{p} = 3 \\ 2) \frac{-1}{9} \end{array}$$

ج) $4x^2 - 4x - 3 = 0 \Rightarrow x^2 - 4x - 12 = 0 \Rightarrow (x-6)(x+2) = 0 \Rightarrow$

$$\begin{array}{l} 1) \frac{q}{c} = \frac{3}{2} \\ 2) \frac{-2}{4} = \frac{-1}{2} \end{array}$$

د) $2x^2 - 5x - 12 = 0 \Rightarrow x^2 - 5x - 12 = 0 \Rightarrow (x+3)(x-1) = 0 \Rightarrow$

$$\begin{array}{l} 1) \frac{-3}{2} \\ 2) \frac{1}{2} = 4 \end{array}$$

ریشه ها

الف) $x^2 - 5x - 14 = 0 \Rightarrow (x-7)(x+2) = 0 \Rightarrow$

$$\begin{array}{l} 1) x=7 \\ 2) x=-2 \end{array}$$

ب) $2x^2 + 5x + 3 = 0 \Rightarrow x = -1$

$$\begin{array}{l} 1) x=-1 \\ 2) \frac{-c}{a} = \frac{-3}{2} \end{array}$$

ج) $x^2 + 2x + 3 = 0 \Rightarrow x = \frac{-2 \pm \sqrt{4-12}}{2} = \frac{-2 \pm \sqrt{-8}}{2} = \frac{-2 \pm 2\sqrt{2}i}{2} = -1 \pm \sqrt{2}i$

د) $2x^2 + 3x - 2 = 0 \Rightarrow x = \frac{-3 \pm \sqrt{9-4(-2)}}{4} = \frac{-3 \pm \sqrt{17}}{4}$

$$\begin{array}{l} 1) \frac{-1 + \sqrt{17}}{4} \\ 2) \frac{-1 - \sqrt{17}}{4} \end{array}$$

ریشه در اعداد حقیقی ندارد

$A \times B = \{(1,2), (1,3), (2,2), (2,3), (3,2), (3,3)\}$

$B^Y = \{(2,2), (2,3), (3,2), (3,3)\}$

$A \times B^Y = \{(1,2), (1,3)\}$

الف) $f(x) = \{(3, m^2), (2, 1), (-3, m), (-2, m), (3, m+2), (m, 4)\} =$

$\Rightarrow \{(3, 1), (2, 1), (-3, -1), (-2, -1), (3, 1), (-1, 4)\} \Rightarrow m = -1$

$\Rightarrow \{(3, 4), (2, 1), (-3, 2), (-2, 2), (3, 4), (2, 4)\} \Rightarrow m = 2$

ب) $g(x) = \{(3, m^2), (2, 1), (m, 4), (3, m+2), (-2, m), (-1, 3)\} =$

$\Rightarrow \{(3, 1), (2, 1), (-1, 4), (3, 1), (-2, -1), (-1, 3)\} \Rightarrow m = -1$

$\Rightarrow \{(3, 4), (2, 1), (2, 4), (3, 4), (-2, 2), (-1, 3)\} \Rightarrow m = 2$

در ازای هیچ مقداری از m تابع نسبت

$f(x) = \{ \underbrace{(1, a^2)}_*, \underbrace{(1, 3a-2)}_*, (a^2, 3a+2) \} \Rightarrow * \Rightarrow a^2 = 3a-2 \Rightarrow a^2 - 3a + 2 = 0 \xrightarrow{a+b+c=0} \begin{cases} 1) a = +1 \\ 2) a = +2 \end{cases}$

$1) \Rightarrow \{ \underbrace{(1, 1)}_\alpha, \underbrace{(1, 1)}_\alpha, \underbrace{(1, 1)}_\alpha \} \Rightarrow a = 1 \quad \{ 2) \Rightarrow \{ \underbrace{(1, 1)}_\alpha, \underbrace{(1, 1)}_\alpha, \underbrace{(1, 1)}_\alpha \} \Rightarrow a = 1 \quad \boxed{a = 1} \checkmark$

$f(x) = \begin{cases} x^2-1 & x \leq 1 \\ ax+b & 1 < x < 2 \\ x^2 & x \geq 2 \end{cases} \Rightarrow \begin{cases} 1) x=1 \Rightarrow (1)^2-1 = a+b \Rightarrow a+b=0 \\ 2) x=2 \Rightarrow 2a+b = (2)^2 \Rightarrow 2a+b=4 \end{cases} \Rightarrow \begin{cases} a+b=0 \\ -b=1 \Rightarrow b=-1 \Rightarrow a=1 \end{cases} \Rightarrow \boxed{a \times b = (1) \times (-1) = -1}$

$f(x) = \begin{cases} 2x-3 & x \geq K \\ x^2-3x & x < K \end{cases} \Rightarrow x=K \Rightarrow 2K-3 = K^2-3K \Rightarrow K^2-5K+3=0 \Rightarrow \boxed{K = \frac{5 \pm \sqrt{13}}{2}}$

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

ب) $|x| + |y| = 3 \Rightarrow \begin{cases} y=3 \\ y=-3 \end{cases}$

ج) $|y| = \sqrt{1-\cos x} \Rightarrow 1-\cos x = 0 \Rightarrow \cos x = 1 \Rightarrow x = 0, 2\pi, \dots$

د) $y^2 + x^2 + 2x + 1 = 0 \Rightarrow y^2 + (x+1)^2 = 0 \Rightarrow x = -1, y = 0$

الف) $\sqrt[3]{y+x} = 2x-2 \Rightarrow \begin{cases} \sqrt[3]{y_1+x_1} = -x_1^2+2x_1-2 \\ \sqrt[3]{y_2+x_2} = -x_2^2+2x_2-2 \end{cases} \Rightarrow \sqrt[3]{y_1} = \sqrt[3]{y_2} \Rightarrow \boxed{y_1 = y_2} \checkmark$

ب) $y^3 + 2y = 5x \Rightarrow \begin{cases} y_1^3 + 2y_1 = 5x \\ y_2^3 + 2y_2 = 5x \end{cases} \Rightarrow y_1^3 + 2y_1 = y_2^3 + 2y_2 \Rightarrow y_1^3 - y_2^3 + 2y_1 - 2y_2 = 0 \Rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2) = 0$

$\Rightarrow (y_1 - y_2)(y_1^2 + y_1y_2 + y_2^2 + 2) = 0$

1) $y_1 = y_2$

2) $y_1 = \frac{-y_2 \pm \sqrt{y_2^2 - 4(y_2^2 + 2)}}{2} = \frac{-y_2 \pm \sqrt{-3y_2^2 - 8}}{2}$

الف) $x \sin y = y \sin x \xrightarrow{x=y} x \sin x = x \sin x$

$x^2 + y^2 - 2xy = 0 \Rightarrow (x-y)^2 = 0 \Rightarrow \boxed{x=y}$

ب) $\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}} = 2 \Rightarrow \frac{x}{y} + \frac{y}{x} = 2 \Rightarrow \frac{x^2 + y^2}{xy} = 2 \Rightarrow x^2 + y^2 - 2xy = 0 \Rightarrow (x-y)^2 = 0 \Rightarrow x=y$