

$x f(x) \geq 0$

$f(x) = 0$

$f(x) = y$

|          |    |    |   |   |   |
|----------|----|----|---|---|---|
| $x$      | -5 | -2 | 0 | 2 | 5 |
| $f(x)$   | +  | 0  | - | 0 | + |
| $x f(x)$ | -  | 0  | + | 0 | + |

$x \in [-5, 0] \cup [2, 5]$

$\frac{-x}{f(x)} \geq 0$

$f(x) \neq 0$

$\frac{x}{f(x)} \leq 0$

$x \in (-2, 2) - \{0\}$

$x \in (-2, 2)$

$f(2) - 2f(2) = 5 - 6 + 7 = 2$

$-f(2) = 2$

$f(2) = -2$

$f(-2) - 2(-2) = 5 + 6 + 7$

$f(-2) + 5 = 15$

$f(-2) = 10$

$f(f(5)) + f(f(1)) = f(2) + f(5)$

$f(5) = 5 - \sqrt{5+7} = 2$

$f(1) = 2+3=5$

$f(2) = 7$

$7 + 5 = 12$

$f(x-1) - f(x) = 4x+2$

$f(x) = ax^2 - bx + 2$

$f(x-1) = a(x-1)^2 - b(x-1) + 2$

$a(x^2 - 2x + 1) - bx + b + 2$

$f(x-1) = ax^2 - 2ax + a - bx + b + 2 = 4x+2$

$-2ax + a + b = 4x+2 \Rightarrow -2ax + (a+b) = 4x+2$

$-2a = 4$

$a = -2$

$-2+b = 2$

$b = 4$

$a-b = -6$

$$f(x) = \frac{x^2 + 4x + 5}{x^2 + 4x + 7}$$

$$f(\sqrt{3}-1) \rightarrow \frac{(\sqrt{3}-1)^2 + 4(\sqrt{3}-1) + 5}{(\sqrt{3}-1)^2 + 4(\sqrt{3}-1) + 7} = \frac{3 + 4 - 4\sqrt{3} + 4\sqrt{3} - 1 + 5}{3 + 4 - 4\sqrt{3} + 4\sqrt{3} - 1 + 7} = \frac{5}{6} = \frac{5}{6}$$

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

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

$$f(-3) = (-3)^2 + 1 = 10$$

$$الف) \frac{f}{g} = \left\{ \left( \frac{2}{5}, \frac{0}{5} \right), \left( 1, \frac{4}{8} \right), \left( 0, \frac{2}{4} \right) \right\}$$

$$g(x) = \sqrt{9-x^2}$$

$$9-x^2 \geq 0$$

$$x^2 \leq 9$$

$$x \leq 3$$

$$x \geq -3$$

$$[-3, 3] \cap f(x) = 1, 0$$

$$ب) \frac{g}{f} = \left\{ \left( \frac{2}{5}, \frac{0}{5} \right), \left( 1, \frac{4}{8} \right), \left( 0, \frac{2}{4} \right) \right\}$$

مولفه های اول یکسان

$$الف) 2f(x) = \left\{ (2, 2), (3, 4), (-5, 4), (1, -4) \right\}$$

$$ب) f(x) + 1 = \left\{ (2, 3), (3, 5), (-5, 5), (1, -1) \right\}$$

$$ج) 2f(x) + 1 = \left\{ (2, 5), (3, 9), (-5, 9), (1, -3) \right\}$$

$$د) f(2x) = \left\{ (1, 1), \left( \frac{3}{2}, 4 \right), \left( -\frac{5}{2}, 2 \right), \left( \frac{1}{2}, -2 \right) \right\}$$

$$2x = 2 \Rightarrow x = 1 \quad 2x = \frac{3}{2} \Rightarrow x = \frac{3}{4} \quad 2x = -\frac{5}{2} \Rightarrow x = -\frac{5}{4} \quad 2x = \frac{1}{2} \Rightarrow x = \frac{1}{4}$$

مولفه های اول یکسان  
فقط دوم تغییر کنند

$$f(x) \cap g(x) = \left\{ 1, 2, 3 \right\} \rightarrow \left\{ (1, 4), (2, 2), (3, 1) \right\}$$

$$الف) f-g = \left\{ (1, 4-0), (2, 3-1), (3, 1-(-1)) \right\}$$

$$ب) \frac{2f}{g} = \left\{ \left( \frac{2}{5}, \frac{0}{5} \right), \left( 2, \frac{6}{4} \right), \left( 3, \frac{2}{-1} \right) \right\} = \left\{ \left( \frac{2}{5}, 0 \right), \left( 2, \frac{3}{2} \right), \left( 3, -2 \right) \right\}$$