

۱- $f(x) = (0, -4)$ منبیه $f(0) = 0$ $f(x) = (4, 0)$ منبیه
 $x > 4 = f(x)$ منبیه
 $x > -4 \rightarrow x < 0$ منبیه $\rightarrow x \cdot f(x) > 0$
 $x = 0: x \cdot f(x) = 0$
 $x > 0: x < 4$ منبیه $\rightarrow x \cdot f(x) > 0$
 دامنه: $(-\infty, -4) \cup (0, 4)$

۲- $y = \sqrt{\frac{-x}{f(x)}} = f(-4) = 0$ $f(x) = -2$ منبیه است $f(-2) = 0$
 $f(x) = -2$ منبیه است $f(0) = 0$ $f(x) = 0$ منبیه است $f(x) = x$ منبیه
 $f(x) \neq 0 \Rightarrow \frac{x}{f(x)} > 0$
 دامنه: $(-2, 0) \cup (0, 4)$
 اعداد صحیح: ۴، ۷، ۱، ۹، ...

۳- $f(x) - 2f(2) = x^2 - 3x + 4$
 $f(2) - 2f(2) = 4 - 4 + 4 = 4 = 2 - f(2) = 2 - 4 = -2$
 $f(x) - 2f(2) = x^2 - 3x + 4 + f(x) + 4 = x^2 - 3x + 8 + f(x) =$
 $x^2 - 3x$
 $f(-2) + f(-2) = (-2)^2 - 3(-2) = 4 + 6 = 10$
 $f(-2) = 10$

۴- $f(f(4)) + f(f(1)) = f(4) = 4 - \sqrt{4+4} = 4 - \sqrt{8} = 4 - 2\sqrt{2}$
 $f(1) = f(1) + 2 = 1 + 2 = 3$ $f(f(4)) + f(f(1)) = f(2) +$
 $f(4) = 2(4) + 2 = 8 + 2 = 10$ $f(4) = 10$
 $f(f(4)) + f(f(1)) = 10$

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

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

$$(\sqrt{x}-1)^2 + 1(\sqrt{x}-1) + a = (\sqrt{x}-1)^2 + 1(\sqrt{x}-1) + 1 =$$

$$(\sqrt{x}-1)^2 + 1(\sqrt{x}-1) + a = \sqrt{x}-1+a = \sqrt{x} \Rightarrow a=1$$

$$f(\sqrt{x}-1) = \sqrt{x}-1$$

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

$$\sqrt{x}-1 + \sqrt{x} = 4 \Rightarrow f(\sqrt{x}-1) = \frac{4}{9} = \frac{2}{3} \Rightarrow f(\sqrt{x}-1) = \frac{2}{3}$$

$$t = x - \frac{1}{x} \quad x^2 - tx - 1 = 0 \Rightarrow tx = x^2 - 1 \Rightarrow x = \frac{t \pm \sqrt{t^2 + 4}}{2}$$

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

$$x^2 + \frac{1}{x^2} = t^2 + 2 \quad f(t) = t^2 + 2 \Rightarrow f(x) = x^2 + 2$$

$$f(-3) = -9 + 2 = -7 \Rightarrow f(-3) = 11$$

$$x^2 \geq 0 \Rightarrow x \leq 9 \Rightarrow -3 \leq x \leq 3-9$$

$$\frac{f}{g}; \frac{f(x)}{g(x)} = (x) \left(\frac{f}{g} \right) \quad g(x) \neq 0 \quad \frac{f}{g} = \left\{ (2, 0), (1, -\sqrt{2}), (0, \frac{1}{\sqrt{2}}) \right\}$$

$$\frac{g}{f}; f(x) \neq 0 \quad x=2; f(2)=0 \quad x=1; f(1); -\frac{1}{\sqrt{2}} \quad g(1) = \frac{1}{\sqrt{2}}$$

$$\Rightarrow = -\sqrt{2} \quad x=0; f(0)=2, g(0)=2 \left(\frac{g}{f} \right) x=0 = \frac{1}{2} \quad x=2$$

$$\frac{g}{f} = \left\{ (1, -\frac{1}{\sqrt{2}}), (0, \frac{1}{2}) \right\}$$

$$\left\{ (1, 1), (2, 1), (3, 1), (4, 1), (5, 1), (6, 1), (7, 1), (8, 1), (9, 1) \right\}$$

$$f(x) = 1 \quad f(2) = 1 \quad f(3) = 1 \quad f(4) = 1 \quad f(5) = 1 \quad f(6) = 1 \quad f(7) = 1 \quad f(8) = 1 \quad f(9) = 1$$

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

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

$$f(x) + 1 = 1$$

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

$$f(x) + 1 = 3$$

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

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

$$f(x) + 1 = 6$$

$$f(x) + 1 = 7$$

$$f(x) + 1 = 8$$

$$f(x) + 1 = 9$$

$$f-g = x=1; (f-g)(1) = f(1) - g(1) = 1 - 0 = 1$$

$$x=2; (f-g)(2) = f(2) - g(2) = 1 - 1 = 0$$

$$x=3; (f-g)(3) = f(3) - g(3) = 1 - 1 = 0$$

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

$$\frac{f}{g} = g(x) \neq 0 \quad x=2; \frac{f}{g}(2) = \frac{f(2)}{g(2)} = \frac{1}{1} = 1$$

$$\frac{f}{g} = \left\{ (2, 1), (3, 1) \right\}$$

$$\frac{f}{g}(3) = \frac{f(3)}{g(3)} = \frac{1}{1} = 1$$