

$$f(x) = ax + b$$

$$f(f(x)) = a(ax+b) + b = \underbrace{a^2x}_{b(a+b)} + \underbrace{ab+b}_{b(a+b)} = \underbrace{4x}_{b(a+b)} + \underbrace{3}_{b(a+b)}$$

$$g(x) = a'x + b'$$

$$g(2x+2) = 3x-2$$

$$\left. \begin{array}{l} f(-1) = 2(-1) + 1 = -1 \\ -2(-1) - 2 = -1 \end{array} \right\} \Rightarrow g(-1) = ? \quad g(-1) = 3(-2) - 2$$

$$2x + 2 = -1 \Rightarrow 2x = -3 \Rightarrow \boxed{x = -1.5}$$

$$\boxed{g(-1) = -7}$$

$$g \circ f: \frac{1}{|x+|x|| - \sqrt{x+|x|}}$$

$$x > 0$$

$$D_{g \circ f} = \mathbb{R}^+$$

$$x + |x| \neq \sqrt{x+|x|} \quad \begin{array}{l} x < 0 \rightarrow 0 = 0 \times \\ x = 0 \rightarrow 0 \times \\ x > 0 \rightarrow 2x - \sqrt{2x} \checkmark \end{array}$$

$$(f+g) \circ f$$

$$f(x) = \sqrt{1-x^2} \quad g(x) = \sqrt{x}$$

$$D_f: [-1, 1] \quad D_g = [0, +\infty)$$

$$D_{(f+g) \circ f}: \{x \in D_f, f(x) \in D_{f+g}\} \quad D_f \cap D_g = [0, 1]$$

$$D_{(f+g) \circ f} = [-1, 1]$$

$$f\left(\frac{x+1}{x-2}\right) = \sqrt{x+1} \quad \frac{x+1}{x-2} = t \Rightarrow x = -\frac{-2t-1}{t-2} = \frac{2t+1}{t-2}$$

$$f(t) = \sqrt{\frac{2t+1}{t-2}} + 1 = \frac{1^2 t - 11}{t-2} \Rightarrow \boxed{f(x) = \frac{1^2 x - 11}{x-2}}$$

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

$$f(t) = t(t^2 - 2) = t^3 - 2t \Rightarrow \boxed{f(x) = x^3 - 2x}$$

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

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

$$(x\sqrt{x}-1)(x\sqrt{x}-\sqrt{2})$$

$$\downarrow \quad \downarrow$$

$$\boxed{x=1} \quad \boxed{x=2}$$

$$2-1=1$$



$f\left(\frac{x}{y}\right) \xrightarrow{\frac{y}{x}(1)} \cot \frac{\pi}{4} = \sqrt{1}$ $f(\sqrt{x}) \xrightarrow{\sqrt{x} \cdot 1} \sqrt{(\sqrt{x})^2 + 1} \Rightarrow \sqrt{x+1} = \text{cloud}$	$\log\left(\frac{x}{y}\right) = ?$ $d(x) = \begin{cases} \cos \frac{\pi x}{4} & x \leq 1 \\ \sqrt{x^2 + 1} & x > 1 \end{cases}$
$\frac{2x-1}{x^2} = \frac{x}{x^2} - \frac{1}{x^2} \Rightarrow f(t) = 2t - t^2 \Rightarrow f(x) = -x^2 + 2x$ $f\left(\frac{1}{x}\right) = 2\left(\frac{1}{x}\right)^2 = \frac{1}{x^2}$ $f\left(\frac{1}{\sqrt{x}}\right) = \frac{1}{\left(\frac{1}{\sqrt{x}}\right)^2} = \frac{1}{\frac{1}{x}} = x$	$f\left(\frac{1}{x}\right) = \sqrt{\frac{1}{x^2} + 1} = \text{cloud}$ $g(x) = 2 \cos^2 x$ $d(x) = [x]$ $g(x) = \frac{2}{1-x}$
$f \circ g(x) = \left[\frac{x}{1-x} \right] \xrightarrow{x=\sqrt{2}} \left[\frac{\sqrt{2}}{1-\sqrt{2}} \right]$ $\left[\frac{\sqrt{2}}{1-\sqrt{2}} \right] = \left[\frac{\sqrt{2}}{\frac{1-\sqrt{2}}{1+\sqrt{2}}} \right] = \left[\frac{\sqrt{2}(1+\sqrt{2})}{1-2} \right] = \left[\frac{\sqrt{2} + 2}{-1} \right] = \left[-\sqrt{2} - 2 \right]$	$f\left(\frac{\pi}{4}\right) = \sin \frac{\pi}{4} = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$ $g\left(\frac{1}{\sqrt{x}}\right) = \frac{\sqrt{2}}{2} \sqrt{1 - \frac{1}{x}} = \text{cloud}$ $d(x) = \sin x$ $g(x) = x \sqrt{1-x^2}$
$d(x) = \{(4,5), (4,8), (8,12), (10,12)\}$ $g(x) = \{(4,4), (2,4), (4,1), (8,10)\}$ $(R \cap Dg) = \emptyset$ هیچ عضو از برد در دامنه g نیست $(Df \cap Rg) = \emptyset \Rightarrow \emptyset \in \text{Im } f \Rightarrow \emptyset \in \text{Im } f \circ g$	الف: $\log(x)$ $\left(\begin{smallmatrix} (4,5) & (2,4) & (4,12) \\ (8,12) \end{smallmatrix} \right)$ ب: $g \circ f$ $\in$ هیچ عضو از برد در دامنه g نیست ج: $f \circ g$ $\in \emptyset \Rightarrow \emptyset \in \text{Im } f \Rightarrow \emptyset \in \text{Im } f \circ g$ د: $g \circ g(x)$ $\in (4,1) (2,4) (4,10)$
$(4,1) \in \text{Im } g$ $(4,1) \in \text{Im } f$ $(4,1) \in \text{Im } f \circ g$	$(4,1) \in \text{Im } g$ $(4,1) \in \text{Im } f$ $(4,1) \in \text{Im } f \circ g$