

$$f\left(\frac{y}{x}\right) = \cot \frac{\pi}{y} = \sqrt{y} \rightarrow f(\sqrt{y}) = \sqrt{y+1} = y$$

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$$\text{اف) } f\left(\frac{1}{x}\right) = \sqrt{\frac{y x - 1}{x^2}} \rightarrow f(x) = y \cos x \rightarrow g\left(\frac{\pi}{y}\right) = y \cos \frac{\pi}{y} = \frac{1}{y}$$

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$$f\left(\frac{1}{y}\right) = \sqrt{\frac{y-1}{y}} = \frac{\sqrt{y}}{y}$$

$$\text{ب) } g(\sqrt{y}) = \frac{\sqrt{y}}{1-\sqrt{y}} = -\sqrt{y}-y \rightarrow f(-\sqrt{y}-y) = [-\sqrt{y}-y] = -y$$

$$f\left(\frac{y}{x}\right) = \sin \frac{\pi}{x} = \frac{y}{y} \rightarrow g\left(\frac{\sqrt{y}}{y}\right) = \frac{\sqrt{y}}{y} \sqrt{1-\frac{y}{y}} = \sqrt{\frac{y}{y}} \sqrt{\frac{y}{y}} = \frac{y}{y} = \frac{1}{y}$$

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$$\text{اف) } \begin{matrix} x \xrightarrow{g} y \xrightarrow{f} \omega \\ y \rightarrow x \rightarrow \omega \\ 4 \rightarrow 1 \rightarrow 12 \\ 1 \rightarrow 10 \rightarrow 14 \end{matrix} \rightarrow f \circ g = \{(x, \omega), (y, \omega), (4, 12), (1, 14)\} \quad \text{ب) } \emptyset \quad \text{ج) } \emptyset$$

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$$\text{د) } \begin{matrix} x \xrightarrow{g} y \xrightarrow{f} 1 \\ y \rightarrow x \rightarrow 4 \\ 4 \rightarrow 1 \rightarrow 10 \end{matrix} \rightarrow g \circ f = \{(x, 1), (y, 4), (4, 10)\}$$

$$(x, 1) \in g \circ f \Rightarrow x \xrightarrow{g} y \xrightarrow{f} 1 \Rightarrow y = \omega \rightarrow (a, b) \rightarrow (x, \omega)$$

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$$g(yx+y) = yx-y \rightarrow yx+y = z \rightarrow x = \frac{z-y}{y} \rightarrow g(x) = \frac{yx-1y}{y}$$

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$$f(ax+b) = a^x x + ab + b = x + y \rightarrow \begin{cases} a^x = x \rightarrow a = \pm y \\ b(a+1) = y \end{cases} \rightarrow \begin{cases} a = y \rightarrow b = 1 \\ a = -y \rightarrow b = -y \end{cases}$$

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$$\rightarrow f(x) = yx + 1 \xrightarrow{f(1)} -1 \rightarrow g(-1) = -1$$

$$f \begin{cases} 0 < x < 2 \\ x < 0 \end{cases} \quad D_f = \mathbb{R} \quad D_g = \mathbb{R} - [0, 1] \quad D_{g \circ f} = \{x \in \mathbb{R} : \sqrt{x+|x|} \neq \{0, 1\}\}$$

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$$\sqrt{x+|x|} = 0 \quad D_{g \circ f} = (-\infty, 0] \quad \sqrt{|x|+x} = 1 \rightarrow x+|x| = 1 \rightarrow D_{g \circ f} = \{1\}$$

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$$D_{g \circ f} = \mathbb{R} - (-\infty, 0] \cup \{1\}$$

$$D_f = [-1, 1] \quad D_g = [0, +\infty) \Rightarrow D_{f+g} = [0, 1]$$

$$D_{(f+g) \circ f} = \left\{ x \in [-1, 1] : 0 \leq \sqrt{1-x^2} \leq 1 \right\} \Rightarrow \boxed{D_{(f+g) \circ f} = [-1, 1]}$$

$$\text{الف) } \frac{t^{p+1}}{x-2} = t \rightarrow t^{p+1} = t(x-2) \rightarrow x = \frac{t^{p+1}}{t-2} \rightarrow f(x) = \frac{1}{x-2} + \infty$$

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

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

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$$\left. \begin{array}{l} g(1) = 0 \\ g(\sqrt{x}) = 0 \end{array} \right\} \begin{array}{l} x\sqrt{x} = 1 \rightarrow \boxed{x=1} \\ x\sqrt{x} = 2 \rightarrow \boxed{x=4} \end{array}$$

$$x_2 - x_1 = 4 - 1 = 3$$