

$$f(f(\frac{1}{e})) = f(\cot \frac{\pi}{4}) = f(\sqrt{e}) = \sqrt{(\sqrt{e})^2 + 1} = 2$$

$$\text{الف) } f(g(\frac{\pi}{e})) = f(2 \cos^2 \frac{\pi}{e}) = f(\frac{1}{r}) = \sqrt{\frac{r-1}{r}} = \frac{\sqrt{e}}{r}$$

$$\text{ب) } f(g(\sqrt{2})) = f(\frac{\sqrt{2}}{1-\sqrt{2}}) = [\frac{\sqrt{2}}{1-\sqrt{2}}] = [\frac{\sqrt{2}(1+\sqrt{2})}{1-2}] = [-\sqrt{2} - 2] = [-3, -] = -4$$

$$g(f(\frac{\pi}{4})) = g(\sin \frac{\pi}{4}) = g(\frac{\sqrt{2}}{2}) = \frac{\sqrt{2}}{2} \sqrt{1 - \frac{1}{2}} = \frac{\sqrt{2}}{2\sqrt{2}} = \frac{1}{2}$$

$$\text{الف) } \{(4, 5), (2, 5), (6, 12), (8, 12)\}$$

$$\text{ب) } \emptyset$$

$$\text{ج) } \emptyset$$

$$\text{د) } \{(4, 8), (2, 4), (6, 10)\}$$

$$f(g(4)) = 2 \Rightarrow g(4) = 3 \Rightarrow a = 4 \quad (a, b) = (4, 5)$$

$$g(f(4)) = 1 \Rightarrow g(5) = 1 \Rightarrow b = 5$$

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

$$f(f(x)) = a^2x + ab + b = 4x + 3$$

$$\begin{aligned} a &\begin{cases} 2 \rightarrow b = 1 \rightarrow f(x) = 2x + 1 \Rightarrow f(-1) = -1 \\ -2 \rightarrow b = -3 \rightarrow f(x) = -2x - 3 \Rightarrow f(-1) = -1 \end{cases} \Rightarrow f(-1) = -1 \end{aligned}$$

$$g(f(-1)) = g(-1) = 3x(-1) - 2 = -5$$

$$2x + c = -1$$

$$x = -1$$

$$x + |x| \geq 0$$

$$x \geq 0 \rightarrow x + |x| \geq 0$$

$$x < 0 \rightarrow x - x \geq 0$$

$$D_{g \circ f} = (0, +\infty) - \{1\}$$

$$f^p(x) - f(x) \neq 0$$

$$f(x)(f(x) - f) \neq 0$$

$$f(x) \neq 0 \rightarrow \sqrt{x + |x|} \neq 0 \Rightarrow x + |x| \neq 0 \Rightarrow x > 0$$

$$f(x) \neq f \rightarrow \sqrt{x + |x|} \neq f \Rightarrow x + |x| \neq f^2 \xrightarrow{x \rightarrow \infty} 2x \neq f^2 \Rightarrow x \neq \frac{f^2}{2}$$

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

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

ب) $f\left(x + \frac{1}{x}\right) = \left(x + \frac{1}{x}\right)^c - 3\left(x + \frac{1}{x}\right)$

$$f(x) = x^c - cx$$

ج) $g(f(x)) = 0 \quad f(x) = 1 \Rightarrow x\sqrt{x} = 1 \quad x^c = 1 \quad x = 1$
 $f(x) = 2\sqrt{2} \Rightarrow x\sqrt{x} = 2\sqrt{2} \quad x^c = 8 \quad x = 2$
 اختلاف طول نقاط $2 - 1 = 1$

$1 - x^r \geq 0$
 $x^r \leq 1$
 $-1 \leq x \leq 1$

$f(f(x)) + g(f(x)) = \sqrt{1 - f^r(x)} + \sqrt{f(x)}$
 $1 - f^r(x) \geq 0$
 $f^r(x) \leq 1$
 $-1 \leq f(x) \leq 1$
 $0 \leq \sqrt{1 - x^r} \leq 1$

$f(x) \geq 0$
 $\sqrt{1 - x^r} \geq 0$

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