

$f(f(x)) = rx + r$ $f(f(x)) = f(ax+b) = a(ax+b) + b = a^2x + ab + b$ (4)
 $g(rx+c) = rx - r$ $f(f(x)) = rx + r \Rightarrow a^2x + ab + b = rx + r$ $a^2 = 1$ $a = \pm 1$
 $g \circ f(-1) = ?$ $g(f(-1)) = ?$ $r(rx+1) - r$
 $\rightarrow f(-1) = 4(-1) + 1 = -3$
 $\rightarrow f(-1) = -4(-1) - 1 = 3$

$f(x) = \sqrt{x+|x|}$ $g(x) = \frac{1}{x^2 - 4x}$ $g \circ f = ?$ $g \circ f = \{x \in D_f, f(x) \in D_g\}$ (5)
 $\sqrt{x+|x|} = 0 \Rightarrow (x \leq 0)$ $\sqrt{x+|x|} = 1 \Rightarrow (x = 1)$ $D_{g \circ f} = \mathbb{R} - \{(-\infty, 0] \cup 1\}$

$f(x) = \sqrt{1-x^2}$ $g(x) = \sqrt{x}$ $(f+g) \circ f = ?$ (6)
 $1-x^2 \geq 0 \Rightarrow x^2 \leq 1 \Rightarrow -1 \leq x \leq 1$ $D_f = [-1, 1]$
 $(f+g) \circ f = [-1, 1]$ $f(f(x)) = \sqrt{1-(f(x))^2} \Rightarrow$
 $1, (f(x))^2 \Rightarrow 0 \leq (f(x))^2 \leq 1$

ا) $f\left(\frac{rx+1}{x-r}\right) = \varepsilon x + \omega$ $\frac{rx+1}{x-r} = t \rightarrow xt - rt = rx + 1 \Rightarrow rt + 1 = xt - rx$ (7)
 $rt + 1 = x(t-r) \Rightarrow x = \frac{rt+1}{t-r}$
 $f(t) = \varepsilon x \frac{rt+1}{t-r} + \omega = \frac{(rt+1)\varepsilon}{t-r} + \omega \Rightarrow f(t) = \frac{\lambda t + \varepsilon}{t-r} + \omega = \frac{\lambda t + \varepsilon + \omega(t-r)}{t-r}$
 $\frac{13t - 11}{t-r} = f(t) \Rightarrow f(x) = \frac{13x - 11}{x-r}$

ب) $f\left(x + \frac{1}{x}\right) = x^r + \frac{1}{x^r}$ $x^r + \frac{1}{x^r} = \left(x + \frac{1}{x}\right)^r - r\left(x + \frac{1}{x}\right) \Rightarrow$
 $t^r - rt = f(t) \Rightarrow f(x) = x^r - rx$

$g(x) = (1, 0) > (r\sqrt{r}, 0)$ (8)
 $f(x) = x\sqrt{x}$ $D_f = x > 0$
 $g(f(x)) = 0$
 $x\sqrt{x} = r\sqrt{r} \Rightarrow x = r$
 $f(x) = 1 \Rightarrow x\sqrt{x} = 1 \Rightarrow (x = 1)$
 $r - 1 = r$