$f(x) = \dfrac{x}{1+x}, \quad D = \{x \mid x \neq -1\}; \quad g(x) = \sin 3x, \quad D = \mathbb{R}.$

(a) $(f \circ g)(x) = f(g(x)) = f(\sin 3x) = \dfrac{\sin 3x}{1 + \sin 3x}$

Domain: $1+\sin 3x \neq 0 \quad \Rightarrow \quad \sin 3x \neq -1 \quad \Rightarrow \quad 3x \neq \dfrac{3\pi}{2} + 2\pi n \quad \Rightarrow$ $x \neq \dfrac{\pi}{2} + \dfrac{2}{3}\pi n.$

(b) $(g \circ f)(x) = g(f(x)) = g\left(\dfrac{x}{1+x}\right) = \sin\left(\dfrac{3x}{1+x}\right).$ Domain: $\{x \mid x \neq -1\}$

(c) $(f \circ f)(x) = f(f(x)) = f\left(\dfrac{x}{1+x}\right) = \dfrac{\dfrac{x}{1+x}}{1 + \dfrac{x}{1+x}}$

Since $f(x)$ is not defined for $x = -1$, and $f(f(x))$ is not defined for $x = -\frac{1}{2}$,
the domain of $(f \circ f)(x)$ is $D = \{x \mid x \neq -1, -\frac{1}{2}\}$.

(d) $(g \circ g)(g) = g(g(x)) = g(\sin 3x) = \sin(3 \sin 3x).$ Domain: $\mathbb{R}$