

Composite Functions

$$\begin{aligned}\text{Let } f(x) &= x+3 \\ g(x) &= x^2 \\ h(x) &= \frac{1}{x}\end{aligned}$$

$$fg(x) = f(x^2) = x^2 + 3$$

$$gf(x) = g(x+3) = (x+3)^2$$

$$hg(x) = h(x^2) = \frac{1}{x^2}$$

$$fh(x) = f\left(\frac{1}{x}\right) = \frac{1}{x} + 3$$

$$hh(x) = h\left(\frac{1}{x}\right) = x$$

$$gg(x) = g(x^2) = x^4$$

$$fgh(x) = fg\left(\frac{1}{x}\right) = f\left(\frac{1}{x^2}\right) = \frac{1}{x^2} + 3$$

$$\text{Find } fg(2) = f(2^2) = f(4) = 4 + 3 = 7$$