

- Let $f(x) = x^2 - 5x$ and let $g(x) = x^3$. What function is $f \circ g$? What about $g \circ f$? What about $f \circ f$?

$$\begin{aligned} \textcircled{1} \quad (f \circ g)(x) &= f(g(x)) = f(x^3) \\ &= (x^3)^2 - 5(x^3) \\ &= \boxed{x^6 - 5x^3} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad (g \circ f)(x) &= g(f(x)) = g(x^2 - 5x) \\ &= \boxed{(x^2 - 5x)^3} \end{aligned}$$

THIS IS NOT EQUAL TO $x^6 - 5x^3$.

* IN GENERAL, YOU SHOULD NOT EXPECT $f \circ g$ TO BE THE SAME AS $g \circ f$.

$$\begin{aligned} \textcircled{3} \quad (f \circ f)(x) &= f(f(x)) = f(x^2 - 5x) \\ &= \boxed{(x^2 - 5x)^2 - 5(x^2 - 5x)} \end{aligned}$$

f plugged into f!