When we work with composite functions, we start with the most inside function(s) and work our way out.

$$f(x) = 3x^2 - x + 4$$

$$g(x) = -x + 7$$

Example 1 – Find $f(g(2))$

We can look at this as finding $f(g(2))$ (notice the colors!).

We will start with the most inside function (the red function) → $g(2)$

$$g(2) = -(2) + 7$$
$$\boldsymbol{g(2) = 5}$$

Now we can plug this into the outer function (the green one) → $f(g(2)) = f(5)$

We will find $f(5)$.

$$f(5) = 3(5)^2 - (5) + 4$$
$$f(5) = 3(25) - (5) + 4$$
$$f(5) = 75 - 5 + 4$$
$$\boldsymbol{f(5) = 74}$$

$$\boldsymbol{f(g(2)) = 74}$$

$$f(x) = 3x^2 - x + 4$$

Example 2 - Find $f(f(2))$

This might look very strange at first, but we will do the same thing as Example 1 – start with the inside function and work our way out.

Think of $f(f(2))$ as $f(f(2))$ – there is a **blue** inside $f(\ )$ function and a **green** outside $f(\ )$ function.

Let's start with the **blue** inside $f(\ )$ function.

$$f(2) = 3(2)^2 - (2) + 4$$
$$f(2) = 3(4) - 2 + 4$$
$$f(2) = 12 - 2 + 4$$
$$\boldsymbol{f(2) = 14}$$

Now we can plug this into the **green** outside $f(\ )$ function → $f(f(2)) = f(14)$

We will find $f(14)$.

$$f(14) = 3(14)^2 - (14) + 4$$
$$f(14) = 3(196) - (14) + 4$$
$$f(14) = 588 - 14 + 4$$
$$\boldsymbol{f(14) = 578}$$

$$\boldsymbol{f(f(2)) = 578}$$