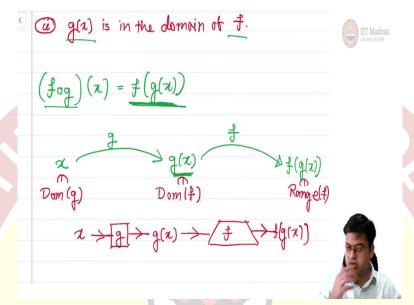


IIT Madras ONLINE DEGREE

Mathematical for Data Science 1 Professor Neelesh S Upadhye Department of Mathematics Indian Institute of Technology, Madras Lecture 49

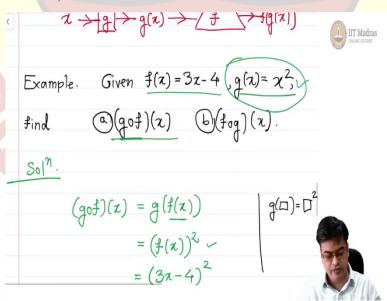
Composition Functions: Examples

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So, we have understood the theory, roughly the theory behind the function, composition, composite functions or composition of two functions. So, it's time to get some practice.

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$$(gof)(x) = g(f(x))$$

$$= (f(x))^{2} - (gof)(x) = g(f(x)) = g(3x-4)^{2}$$

$$= (3x-4)^{2}$$

$$= (3x-4)^{2}$$

$$= (3x-4)^{2}$$

$$= (3x-4)^{2}$$

So, let me start with an example. And in that example, let us take you have been given two functions f(x)=3x-4, and g(x), which is equal to let us say x^2 these are the two functions that are given, then you are asked to find two things one is $g \circ f(x)$, and the other one is obviously $f \circ g(x)$, how to find this? Let us start, let us start with a solution.

So, what can be the solution let us take this function. So, let me write it properly, it is $g \circ f(x)$. So, as per our theory, we have to write this as g(f(x)). So, g(f(x)), you can treat this as, what is f(x) now? f(x) = 3x - 4, and g(x) is x square. So, naturally g(f(x)), so, you go to this function, you treat this g as g. So, let me write it here, you treat this g as a g of a box, and g(x) is nothing but this box squared. So, in particular, if I want to write something about this function, this box right now has an argument which is f(x).

So, I will simply write this as f(x) squared, that is all. Now, the entire process is simplified. So, now, you do not have to worry about what g is, now it simply $f(x)^2$ what is the f(x) fit that when you in and you will get $(3x - 4)^2$. Another way to handle this is you can simply write $g \circ f(x)$ as g(f(x)) fit in the value of f(x) that is g(3x - 4) and what is g(3x - 4) as per our question, it is x^2 . So, 3g(3x - 4) will be $(3x - 4)^2$. So, anyway whichever way is convenient to you, you proceed and you will get this answer correct.

So, what I have done here is I have replaced f(x) in this particular case, I have replaced f(x) = 3x - 4 in this particular case I have written f(x) and replaced what is g(x). So, both ways you can go now.

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$$(fog)(x) = f(g(x))$$

$$= 3g(x) - 4$$

$$= 3x^2 - 4$$



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Soln.

$$(gof)(z) = g(f(z))$$

$$= (f(z))^{2}$$

$$= (3x-4)^{2}$$

$$(gof)(x) = g(f(x)) = g(3x-4) \xrightarrow{\text{Replace}} f(x) = g(3x-4)^{2}$$

$$= (3x-4)^{2}$$



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2 > 19 1> g(x) > (# > 19[x])

Example. Given f(x) = 3x - 4, $g(x) = \chi^2$,

(qof)(x) (fog)(x). find

Soln.

$$(g \circ f)(z) = g(f(z))$$

$$= (f(z))^{2} \sim$$

$$= (3x - 4)^{2}$$



Let us go to the second problem that is a $f \circ g(x)$ and $f \circ g(x)$ is again can be written as $f \circ f(g(x))$. Clear, there is no question, then there are two ways let us go it the first way, what is f(g(x))? So, what is f(x) here? f(x) = 3x - 4 here. So, I will write this as to be equal to 3g(x) - 4.

So again, let me be very clear about this there should not be any confusion in this. So, what is $f(\Delta)$? Δ is an argument. So, this Δ triangle will be $3\Delta - 4$. So, now this triangle is replaced with g(x), that is all. Therefore, your answer is 3x-3g(x)-4. But what is g(x)? Again, go back to the question g(x) is x^2 So, substituted here that means it will be $3x^2 - 4$ and this is the final answer for you in terms of $f \circ g(x)$. So, we are seen how to write the compositions in both ways $g \circ f$ and $g \circ g$.

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Exercise
$$f(x) = x+1$$
 $f(x) = x+1$ $f(x) =$

So, here is a quick exercise for you pause the video, do the exercise and get back the get the answer. So, f(x) = x + 1 and $g(x)=x^2 - 1$. Then simply find $g \circ f(x)$ and $f \circ g(x)$. This is an exercise you stop and get the answer. It will be a good practice to revise the concepts.