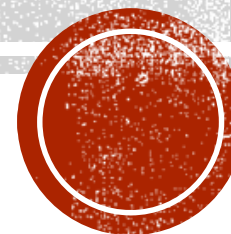


# COMPOSITIONS OF FUNCTIONS

Honors Calculus

Keeper 4



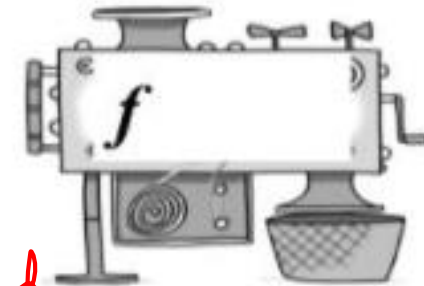
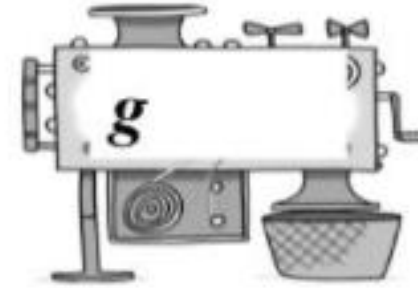
**Substituting** a function or it's value into **another** function.

$$f(g(x))$$

Second

First

(inside parentheses  
always first)



OR

$$f \circ g(x)$$

2nd

1st



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

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



<b>x</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>f(x)</b>	<b>-3</b>	<b>-2</b>	<b>1</b>	<b>4</b>	<b>-1</b>	<b>0</b>
<b>g(x)</b>	<b>-2</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>-1</b>	<b>2</b>

Given the table, evaluate the following:

- $f(-1) = -2$   $(-1, -2)$
- $g(2) = -1$
- $f(-3) = \text{DNE}$



<b>x</b>	-2	-1	0	1	2	3
<b>f(x)</b>	-3	-2	1	4	-1	0
<b>g(x)</b>	-2	0	1	3	-1	2

Given the table, evaluate the following:

means inverse  
 "what x will make  $g(x) = 0$ ?"

4.  $g^{-1}(0)$   $g(x) = 0$   $x = -1$

5.  $f^{-1}(-2)$   $f(x) = -2$   $(?, -2)$   
 $x = -1$



<b>x</b>	-2	-1	0	1	2	3
<b>f(x)</b>	-3	-2	1	4	-1	0
<b>g(x)</b>	-2	0	1	3	-1	2

Given the table, evaluate the following:

6.  $f(g(-1)) = f(0) = 1$

*Handwritten notes: A green arrow points from -1 in the inner function to 0 in the outer function. The word "inside 1st" is written below the inner function. The result 1 is circled in green.*

7.  $(f \circ g)(3) = f(2) = -1$

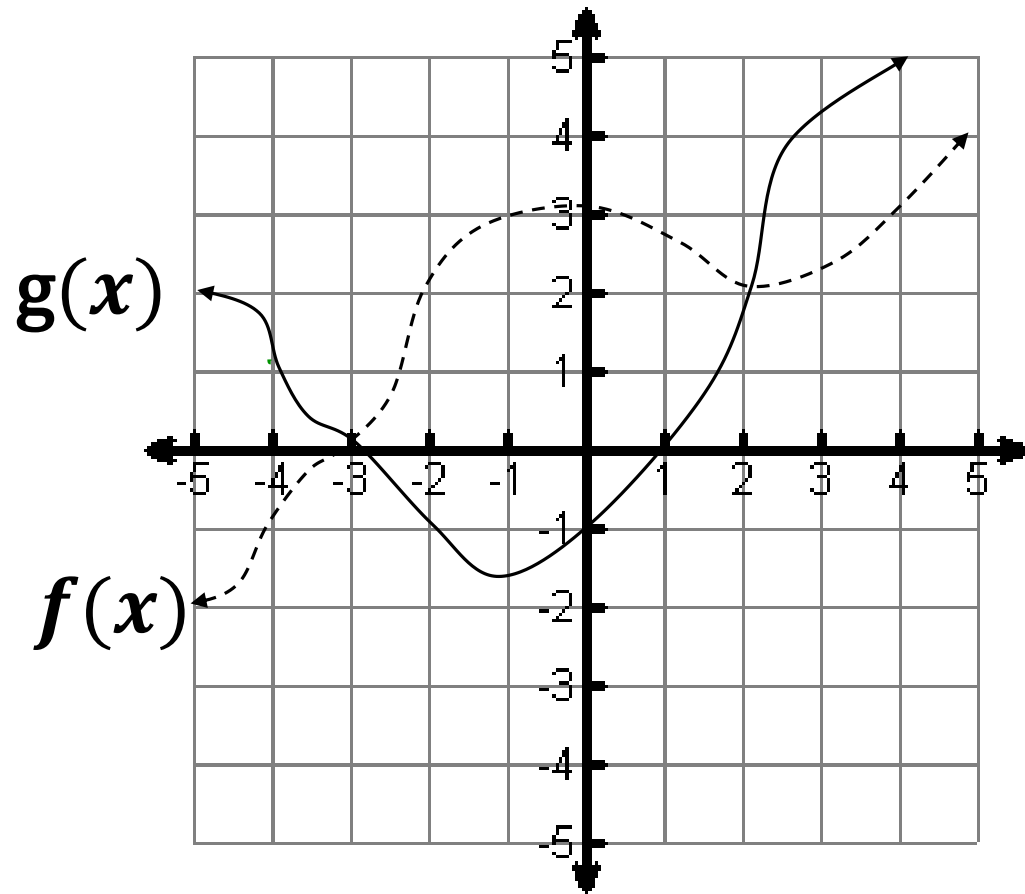
*Handwritten notes: A red arrow points from 3 in the inner function to 2 in the outer function. The word "inside 1st" is written below the inner function, and "out" is written above it. The result -1 is circled in red.*

8.  $(g \circ g)(1) \text{ or } g(g(1)) = g(3) = 2$

*Handwritten notes: A green arrow points from 1 in the inner function to 3 in the outer function. The result 2 is circled in green.*



**Given the graph of  $f(x)$  and  $g(x)$ , evaluate the following:**



1.  $(f \circ g)(1) = f(g(1))$   
 $f(0) = 3$

2.  $(g \circ f)(-2) = g(f(-2))$   
 $g(2) = 2$

3.  $(f \circ f)(-3) = f(f(-3))$   
 $f(0) = 3$

4.  $(f \circ g)(-4) = f(g(-4))$   
 $f(1) = 3$

Given  $f(x) = 3x^2 - 2x$ ,  $g(x) = \ln x$ ,  
 $h(x) = e^x$ , and  $j(x) = x + 4$ , evaluate:

1.  $f(\underline{j(x)})$

*outside*  
*inside*

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

$$3(x+4)(x+4) - 2(x+4)$$

$$3(x^2 + 8x + 16) - 2x - 8 = 3x^2 + 24x + 48 - 2x - 8$$

$$3x^2 + 22x + 40$$

2.  $(g \circ h)(x) =$

*out* *in*

$$\ln(e^x)$$

~~$x \cdot \ln e$~~  =  $x$

3.  $(h(\underline{j(g(x))})) =$

$$j(g(x)) = \ln x + 4$$

$$h(\ln x + 4) = e^{\ln x + 4} = x + 4$$