Composition of Functions

6.5

Secondary Math II Notes

OBJECTIVE: Compose functions graphically and algebraically. Write composition of functions to model scenarios.

Composition of Functions: The composition of two functions is written as $(f°g)(x)$. The function $(f°g)(x) = f(g(x))$.

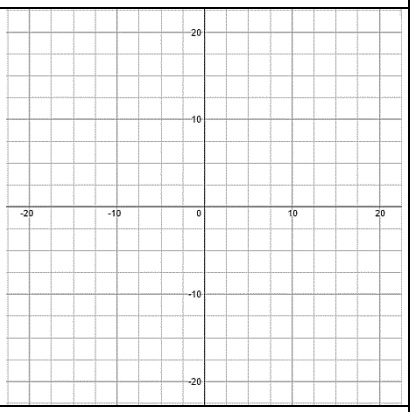
Composition of functions graphically

On a graphing calculator, graph $f(x) = -x - 1$ *and* $g(x) = 2x - 3$.
Fill in the table below

X	f(x)	g(x)
-6	5	-9
-5	4	-8
-4	3	-7
-3	2	-6
-2	1	-5
-1	0	-4
0	-1	-3
1	-2	-2
2	-3	-1
3	-4	0
4	-5	1
5	-6	2
6	-7	3

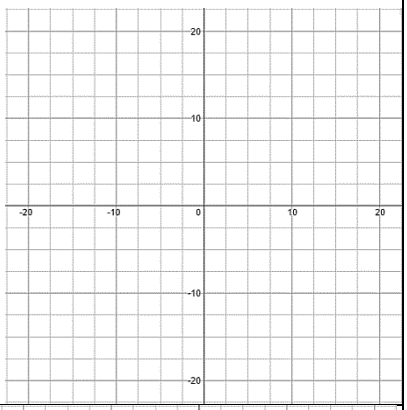
Graph the function $(f°g)(x)$ using the functions to the right.

X	$(f°g)(x)$
-3	5
-2	4
-1	3
0	2
1	1



Graph the function $(g°f)(x)$ using the functions to the right.

X	$(g°f)(x)$
-3	-1
-2	-2
-1	-3
0	-4
1	-5

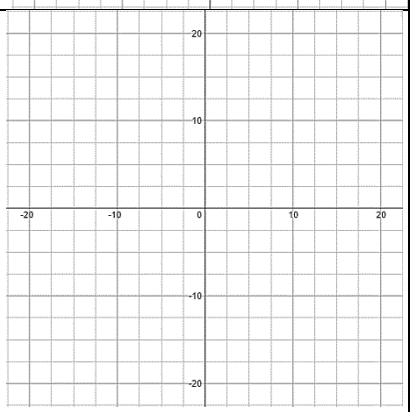


On a graphing calculator, graph $f(x) = x - 2$ *and* $g(x) = -x + 1$.
Fill in the table below

X	f(x)	g(x)
-6	-8	7
-5	-7	6
-4	-6	5
-3	-5	4
-2	-4	3
-1	-3	2
0	-2	1
1	-1	0
2	0	-1
3	1	-2
4	2	-3
5	3	-4
6	4	-5

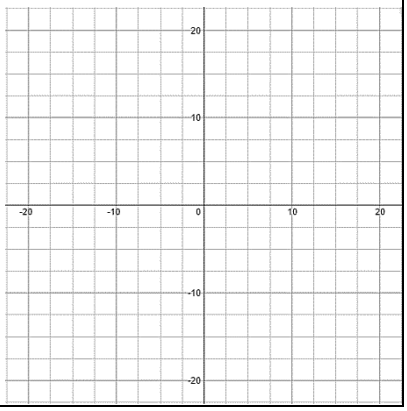
Graph the function g(g(x)) using the functions to the right.

X	g(g(x))
-3	-3
-2	-2
-1	-1
0	0
1	1



Graph the function $f(f(x))$ using the functions to the right.

X	f(f(x))
-3	-7
-2	-6
-1	-5
0	-4
1	-3



Composition of functions algebraically

Use the following functions for the problems below

$f(x) = -5x,\ \ g(x) = 2x - 1,\ \ h(x) = -x^2 - 4x - 1,\ \ k(x) = x^2 - x$

$(f \circ g)(x)$ $(f \circ g)(x) = f(g(x))$ $= f(2x - 1)$ $= -5(2x - 1)$ $= -10x + 5$	$h(f(t))$ $h(f(t)) = h(-5t)$ $= -(-5t)^2 - 4(-5t) - 1$ $= -25t^2 + 20t - 1$	$g(f(3r))$ $g(-5(3r)) = g(-15r)$ $= 2(-15r) - 1$ $= -30r - 1$	$f(h(4))$ $f(-(4)^2 - 4(4) - 1)$ $= f(-33) = 165$
$(g \circ k)(x)$ $(g \circ k)(x) = g(k(x))$ $= g(x^2 - x)$ $= 2(x^2 - x) - 1$ $= 2x^2 - 2x - 1$	$g(g(a))$ $g(g(a)) = g(2a - 1)$ $= 2(2a - 1) - 1$ $= 4a - 3$	$(k \circ f)(2n)$ $(k \circ f)(2n) = k(f(2n))$ $= k(-10n)$ $= (-10n)^2 - (-10n)$ $= 100n^2 + 10n$	$f(f(3))$ $= f(-5(3))$ $= f(-15)$ $= -5(-15)$ $= 75$

Application of Composition of functions

You work forty hours a week at a furniture store. You receive a $220 weekly salary, plus a 3% commission on sales over $5000. Assume that you sell enough this week to get the commission.

a) Write the commission sales as a function of total sales.
S(x)=x-5000

b) Write the commission as a function of the commission sales.
C(r)=0.03r

c) Write the commission as a function of the total sales. The commission is represented by $(c \circ s)(x) = 0.03(x - 5000) = 0.03x - 150$

The table is representing how the formula would work.

Total Sales	$3000	$6000	$8000
Commission sales	$3000-$5000=-$2000	$6000-$5000=$1000	$8000-$5000=$3000
Commission	0	0.03*$1000=$30	0.03*$3000=$90

Maurice's is having an end of season clearance sale. In the mail you receive a coupon for $5 off of a pair of jeans. When you arrive at the store, you find that all jeans are 25% off.

a) Write the cost of the jeans as a function if you used the coupon. *f(x)=x-5*

b) Write the cost of the jeans as a function if you used the discount of 25%. *g(x)=.75x*

Option 1- you use the $5 coupon first and then you use the 25% off on the remaining amount.

Option 2- you use the 25% off first and then you use the $5 off on the remaining amount.

c) Write a function that would represent option 1
d) Write a function that would represent option 2
e) Which option saves you the most money?

Option 1 would be g(f(x))=.75(x-5)=.75x-3.75
Option 2 would be f(g(x))=.75x-5
Since they both have the same coefficient for the x-variable and option 2 subtracts 5 instead of 3.75, option 2 will save you the most money.
