WARMUP

Remember our function machines?

$3 \rightarrow \boxed{f(x)=x^2-4} \rightarrow f(3)=5$

$f(3)=5 \rightarrow \boxed{g(x)=5x+7 \quad 5\cdot 5+7} \rightarrow \boxed{32}$

Composition of functions

$$g(f(3)) = (g \circ f)(3)$$

ex: $f(x) = 6x + 5$

$g(x) = x^2 + 2$

$$(f \circ g)(5) = f(27) = 6\cdot 27 + 5 = 162 + 5 = 167$$

$$\underbrace{g(5)}_{g(5) = 5^2 + 2 = 27}$$

$(f \circ g)(2) = 41$

$g(2) = 2^2 + 2 = 4 + 2 = 6$

$f(6) = 6\cdot 6 + 5 = 36 + 5 = 41$

$(g \circ f)(-1)$

$f(-1) = 6(-1) + 5 = -6 + 5 = -1$

$g(-1) = (-1)^2 + 2 = 1 + 2 = 3$

$(f \circ f)(1)$

$f(1) = 6\cdot 1 + 5 = = 11$

$f(11) = 6\cdot 11 + 5 = 71$

$f(x) = 5x+2 \qquad g(x) = 3x-4$

"Plug g(x) into f for x"

$$(f \circ g)(x) = f(\underline{3x-4}) = 5(3x-4)+2 = 15x-20+2 = 15x-18$$

$$(g \circ f)(x) = g(\underline{5x+2}) = 3(5x+2)-4 = 15x+6-4 = 15x+2$$

$$(f \circ f)(x) = f(5x+2) = 5(5x+2)+2 = 25x+10+2 = 25x+12$$

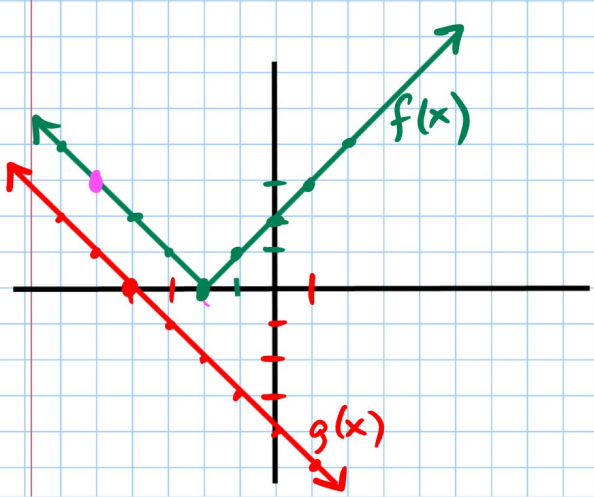
x	f(x)
-1	1
0	4
1	5
2	-1

x	g(x)
-1	0
1	1
4	2
10	-1

$$f(g(4)) = (f \circ \underbrace{g)(4}) = f(2) = -1$$

$$(g \circ \underbrace{f)(0}) = g(4) = 2$$

$$(f \circ f)(-1) = f(1) = 5$$



$$(f \circ \underbrace{g)(1}_{-5}) = f(-5) = 3$$

$$(g \circ f)(-1) = g(1) = -5$$

p593-594 1, 3, 9, 11, 13, 45, 47, 51, 53,