Ch 4
Day 11
Notes

4.4 – F(X) NOTATION

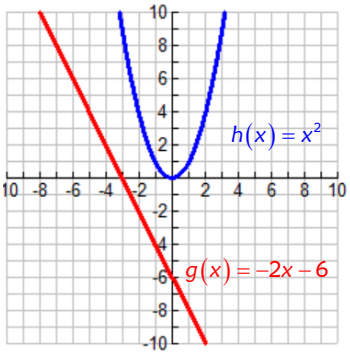
REMEMBER!
f(x) is not "f times x"!

f(x)= ____

OBJECTIVES:

1) Find the sum, difference, product, and quotient of functions.
2) Find the value of a function for a given value of x.
3) Find the composition of functions.

EVALUATING FUNCTIONS WITH A GRAPH



Use the graphs above to compute the following:

1) $h(2)$ = 4 (2, 4)

2) $g(2)$ = −10 (2, −10)

3) $\frac{g(0)}{h(2)}$ = $\frac{-6}{4}$ = $\boxed{\frac{-3}{2}}$

4) $h(g(-3))$

g(−3) = 0 so find h(0).

h(0) = 0

h(g(−3)) = 0

WITHOUT A GRAPH

Let $f(x) = -x^3 + 2x^2$ and $g(x) = -6x - 2$. Evaluate the following:

5) $f(2)$

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

$= -8 + 8$

$f(2) = \boxed{0}$

6) $g(-3)$

$g(-3) = -6(-3) - 2$

$= 18 - 2$

$= \boxed{16}$

7) $\frac{f(-1)}{g(1)}$ = $\boxed{\frac{3}{-8}}$

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

$= 1 + 2 = 3$

$g(1) = -6(1) - 2 = -8$

RULES:

- Sum: $(f+g)(x) = f(x) + g(x)$
- Difference: $(f-g)(x) = f(x) - g(x)$
- Product: $(fg)(x) = f(x) \bullet g(x)$
- Quotient: $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$

If $f(x) = 2x + 5$ and $g(x) = x - 1$ find:

8) $(f+g)(x)$

$(f+g)(x) = f(x) + g(x)$

$= 2x + 5 + x - 1$

$(f+g)(x) = \boxed{3x + 4}$

9) $(f-g)(x)$

$(f-g)(x) = f(x) - g(x)$

$= 2x + 5 - (x - 1)$

$= 2x + 5 - x + 1$

$(f-g)(x) = \boxed{x + 6}$

10) $(fg)(x)$

$(fg)(x) = f(x) \cdot g(x)$

$= (2x + 5)(x - 1)$

$= 2x^2 - 2x + 5x - 5$

$(fg)(x) = \boxed{2x^2 + 3x - 5}$

11) $\left(\frac{f}{g}\right)(x)$

$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$

Can't simplify!!

$\left(\frac{f}{g}\right)(x) = \boxed{\frac{2x+5}{x-1}}$

COMPOSITION: Use the output from one function as the input for another.

"f of g of x" $\quad (f \circ g)(x) = f(g(x))$

"g of f of x" $\quad (g \circ f)(x) = g(f(x))$

To simplify: 1) Plug x into g.
2) Use the result from step 1 in f.

If $f(x) = 3x^2$ and $g(x) = 2x - 1$, find:

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

$g(3) = 2(3) - 1$
$= 5$

$f(5) = 3(5)^2$
$= 3(25)$
$= 75$

$f(g(3)) = 75$

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

$f(3) = 3(3)^2 = 27$

$g(27) = 2(27) - 1$
$= 54 - 1$
$= 53$

$g(f(3)) = 53$

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

$f(3) = 3(3)^2 = 27$

$f(27) = 3(27)^2$
$= 3(\text{A big \#})$ sorry!

27
27
189
54
729

this is not so bad!

$= 3(729)$
$= 2187$

$f(f(3)) = 2187$

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

$f(x) = 3x^2$

$f(g(x)) = 3(2x-1)^2$
$= 3(4x^2 - 4x + 1)$

$f(g(x)) = 12x^2 - 12x + 3$

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

$g(x) = 2x - 1$

$g(f(x)) = 2(3x^2) - 1$

$g(f(x)) = 6x^2 - 1$

If $f(x) = x - 1$ and $g(x) = x^2 - 3x + 1$, find:

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

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

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

$g(f(x)) = x^2 - 5x + 5$

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

$f(x) = x - 1$

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

$f(g(x)) = x^2 - 3x$

YOU TRY!

1) Find (f + g)(x)and (f – g)(x), when f(x) = $3x^3 - 2x^2 + 5x - 1$, g(x) = $x^2 + 7x - 1$. Simplify your answer.

$(f+g)(x) = 3x^3 - 2x^2 + 5x - 1 + (x^2 + 7x - 1)$

$= 3x^3 - x^2 + 12x - 2$

$(f-g)(x) = 3x^3 - 2x^2 + 5x - 1 - (x^2 + 7x - 1)$

$= 3x^3 - 2x^2 + 5x - 1 - x^2 - 7x + 1$

$= 3x^3 - 3x^2 - 2x$

2) Find (f • g)(x), when f(x) = $-x + 2$, g(x) = $x + 1$. Simplify your answer.

$(f \cdot g)(x) = (-x+2)(x+1)$

$= -x^2 - x + 2x + 2$

$= -x^2 + x + 2$

3) Find $\left(\frac{f}{g}\right)(x)$, when f(x) = $6x^{\frac{7}{3}}$, g(x) = $3x^{\frac{2}{3}}$. Simplify your answer. **HINT:** $\frac{12x^9}{6x^6} = 2x^3$

$\left(\frac{f}{g}\right)(x) = \frac{6x^{7/3}}{3x^{2/3}} = 2x^{5/3}$ (just subtract the exponents)

4) Let f(x) = $2x^2 - 3$ and g(x) = $-6x + 2$

a. f(g(x))

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

$f(g(x)) = 2(-6x+2)^2 - 3$

$= 2(36x^2 - 24x + 4) - 3$

$= 72x^2 - 48x + 8 - 3$

$= 72x^2 - 48x + 5$

b. g(f(x))

$g(x) = -6x + 2$

$g(f(x)) = -6(2x^2 - 3) + 2$

$= -12x^2 + 18 + 2$

$= -12x^2 + 20$

c. f(f(x))

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

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

$= 2(4x^4 - 12x^2 + 9) - 3$

$= 8x^4 - 24x^2 + 18 - 3$

$= 8x^4 - 24x^2 + 15$

d. g(f(1))

$f(1) = 2(1)^2 - 3$

$= -1$

$g(-1) = -6(-1) + 2$

$= 6 + 2$

$= 8$

$g(f(1)) = 8$

Check with the key! You'll have a video quiz check on one of these types of problems tomorrow!