Master Ed

UNIT 5 DAY 01 OPERATIONS ON FUNCTIONS

Operations of Functions: Notation and Procedure

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

1-3: Perform the following operations for each problem.

1. $f(x) = 8x - 3;\ g(x) = 4x + 5$

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

$8x-3$
$+4x+5$
$12x+2$

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

$8x-3-(4x+5)$
$-4x-5$
$4x-8$

c. $(f \cdot g)(x) =$

$(8x-3)(4x+5)$
$32x^2+40x-12x-15$
$32x^2+28x-15$

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

$\frac{8x-3}{4x+5}$

2. $f(x) = x^2 + x - 6;\ g(x) = x - 2$

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

x^2+x-6
$+x-2$
x^2+2x-8

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

$x^2+x-6-(x-2)$
$-x+2$
x^2-4

c. $(f \cdot g)(x) =$

$(x-2)(x^2+x-6)$
$x^3+x^2-6x-2x^2-2x+12$
$x^3-x^2-8x+12$

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

$\frac{x^2+x-6}{x-2} = \frac{(x+3)(x-2)}{(x-2)} = x+3$

3. $f(x) = 3x^2 - x + 5;\ g(x) = 2x - 3$

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

$3x^2-x+5$
$+2x-3$
$3x^2+x+2$

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

$3x^2-x+5-(2x-3)$
$-2x+3$
$3x^2-3x+8$

c. $(f \cdot g)(x) =$

$(2x-3)(3x^2-x+5)$
$6x^3-2x^2+10x-9x^2+3x-15$
$6x^3-11x^2+13x-15$

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

$\frac{3x^2-x+5}{2x-3}$

Introduction: Who has the better discount?

Claire and Jadire decide to go out to Taco Bell for lunch. ☺ They each have a 50-cent coupon. In addition, if they show their PAHS student I.D. cards they will also get a 10% discount. Both of them ordered the #3 chalupa value meal for $6.95. Claire's server rang up her order using the value meal coupon, and then the PA 10% discount. Jadire's server rang his up as a 10% discount, then the coupon. Who got the better deal? Jadire

$f(x) = x - 50$
$g(x) = x - .10x = .90x$

$f(g(x)) = f(.90x) = .90x - 50$ = Jadire
$g(f(x)) = g(x-50) = .90(x-50) = .90x - 4.5$ = Claire

Claire: $6.95 - 50 = 6.45$
$.90(6.45)$
5.81 $g(f(x))$

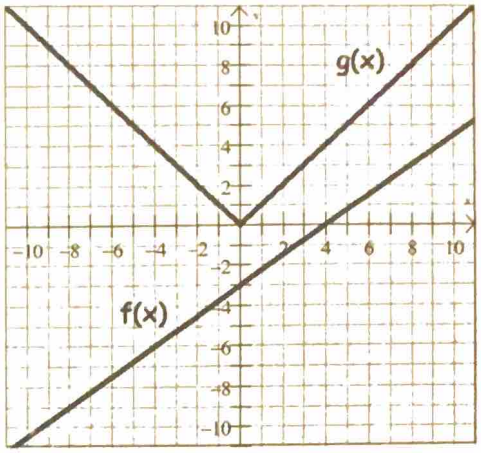
Jadire: $.90(6.95) = 6.26$
$6.26 - .50$
5.76 $f(g(x))$

Composition of functions

- the process of using the output of one function as the input of another function.
  The results where evaluating a value of one function is used to evaluate a value of a second function.
- **Composition of f and g:** written in the form $(f \circ g)(x) = f(g(x))$

4-5: Given the graphed function, find each value algebraically and using the graph.

4. $f(x) = \frac{3}{4}x - 3$ and $g(x) = |x|$



a. f(g(-4))

$g(-4) = |-4| = 4$

$f(4) = \frac{3}{4}(4) - 3 = 3 - 3 = 0$

b. g(f(-4))

$f(-4) = \frac{3}{4}(-4) - 3 = -3 - 3 = -6$

$g(-6) = |-6| = 6$

c. f(g(2))

$g(2) = |2| = 2$

$f(2) = \frac{3}{4}(2) - 3 = \frac{3}{2} - \frac{6}{2} = -\frac{3}{2}$

d. g(f(2))

$f(2) = -\frac{3}{2}$

$g(-\frac{3}{2}) = |-\frac{3}{2}| = \frac{3}{2}$

e. f(g(-2))

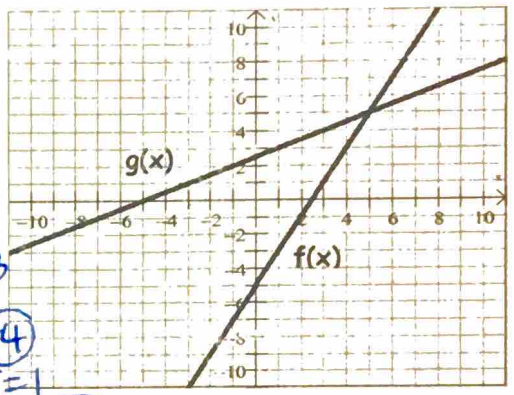
$g(-2) = |-2| = 2$

$f(2) = -\frac{3}{2}$

f. g(f(-2))

$f(-2) = \frac{3}{4}(-2) - 3 = -\frac{3}{2} - \frac{6}{2} = -\frac{9}{2}$ $g(-\frac{9}{2}) = |-\frac{9}{2}| = \frac{9}{2}$

5. $f(x) = 2x - 5$ and $g(x) = \frac{1}{2}(x + 5)$



a. f(g(-4))

$g(-4) = \frac{1}{2}(-4+5) = \frac{1}{2}$

$f(\frac{1}{2}) = 2(\frac{1}{2}) - 5 = 1 - 5 = -4$

b. g(f(-4))

$f(-4) = 2(-4) - 5 = -8 - 5 = -13$

$g(-13) = \frac{1}{2}(-13+5) = \frac{1}{2}(-8) = -4$

c. f(g(3))

$g(3) = \frac{1}{2}(3+5) = \frac{1}{2}(8) = 4$

$f(4) = 2(4) - 5 = 8 - 5 = 3$

d. g(f(3))

$f(3) = 2(3) - 5 = 6 - 5 = 1$

$g(1) = \frac{1}{2}(1+5) = \frac{1}{2}(6) = 3$

6-8: Find (f ° g)(x) and (g ° f)(x).

6. $f(x) = 2x + 7$; $g(x) = -5x - 1$

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

$2(-5x-1) + 7$

$-10x - 2 + 7 = -10x + 5$

$(g \circ f)(x) = g(2x+7)$

$-5(2x+7) - 1$

$-10x - 35 - 1 = -10x - 36$

7. $f(x) = x^2 + 2x$; $g(x) = x - 9$

$(f \circ g)(x) = f(x-9)$

$(x-9)^2 + 2(x-9)$

$x^2 - 18x + 81 + 2x - 18$

$x^2 - 16x + 63$

$(g \circ f)(x) = g(x^2+2x)$

$x^2 + 2x - 9$

8. $f(x) = 3x - 2$ $g(x) = 1/3x + 2/3$

$(f \circ g)(x) = f(\frac{1}{3}x + \frac{2}{3})$

$3(\frac{1}{3}x + \frac{2}{3}) - 2$

$x + 2 - 2 = x$

$(g \circ f)(x) = g(3x-2)$

$\frac{1}{3}(3x-2) + \frac{2}{3}$

$x - \frac{2}{3} + \frac{2}{3} = x$

What do you think it means that they both equal x?