**6.6 Function Operations**.  
Objective: To add, subtract, multiply, and divide functions  
To find the composite of two functions

**Operations on Functions**;

*Let f and g be any two functions.*

|  |  |  |
| --- | --- | --- |
| **Operation** | **Definition** | **Examples: f(x) = 2x; g(x) = x + 1** |
| Addition |  | h(x) = 2x + (x + 1) = 3x + 1 |
| Subtraction |  | h(x) = 2x – (x + 1) = x – 1 |
| Multiplication |  | h(x) = (2x)(x + 1) = 2x2 + 2x |
| Division | ; g(x) |  |

**Domain**:

Domain of h = the x-values that are in the domains of **both** f and g

The domain of a quotient does not include x-values for which the denominator = 0

*Example*:

*Perform each indicated operation, and state the domain.*

f(x) + g(x); where f(x) = 3x3 – 2x2 + 5x - 1 and g(x) = x2 + 7x - 1

f(x) + g(x); (3x3 – 2x2 + 5x – 1) + (x2 + 7x – 1) = **3x3 – 2x2 + 12x – 2**

; where f(x) = 3x and g(x) = 2x5

(3x)(2x5 ) = **6x6**

**Composition of Two Functions**;

Given two functions f(x) and g(x):

Possible combinations

* **= f(g(x))**
* **= g(f(x))**
* **= f(f(x))**
* **= g(g(x))**

For f(g(x)): substitute g(x) for x in the function f(x)

In general, f(g(x)) ≠ g(f(x)) (although it is possible, this would just be a coincidence)

**Domain:**

For h(x) = f(g(x)):

Domain of h = set of all x-values in the domain of g which yield a g(x) which is in the domain of f

*\*\*These are usually crazy for the kids to understand. I try and explain it by plugging a number in and showing them that if we did f(2) then the first problem would be 4(2)=8. So now instead of plugging in a number we actually plug in the entire g(x) equation…*

*Example:*

*Let f(x) = 4x and g(x) = x -1. Perform the indicated operation and state the domain.*

*a) f(g(x)) b) g(f(x))*

*plug the g into f plug the f into g*

*4(x-1)=****4x-4*** *(4x)-1=****4x-1***

*c) f(f(x)) d) g(g(x))*

*plug the f into f plug the g into g*

*4(4x)=****16x*** *(x-1)-1 =* ***x-2***

Extra Examples if they need them:

Let  Perform the given operation and state the domain.

5x-1 -x-1

***6***

Let. Perform the indicated operation, and state the domain for each.

6 6x-1

**9x 4x-2**

**HMWK: page 401 #1-13, 15-35 (odd), 36-38**