OPERATIONS ON FUNCTIONS

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WHY OPERATIONS ON FUNCTIONS?

This concept is very applicable in everyday life because it concerns an input going through a process, ‘function’ or ‘machine’ and returning a different output.

Of all the topics to choose from, we felt this one was the easiest to find examples of real-life applications.

DEFINING
OPERATIONS ON FUNCTIONS

6.3 "Function Operations & Composition"

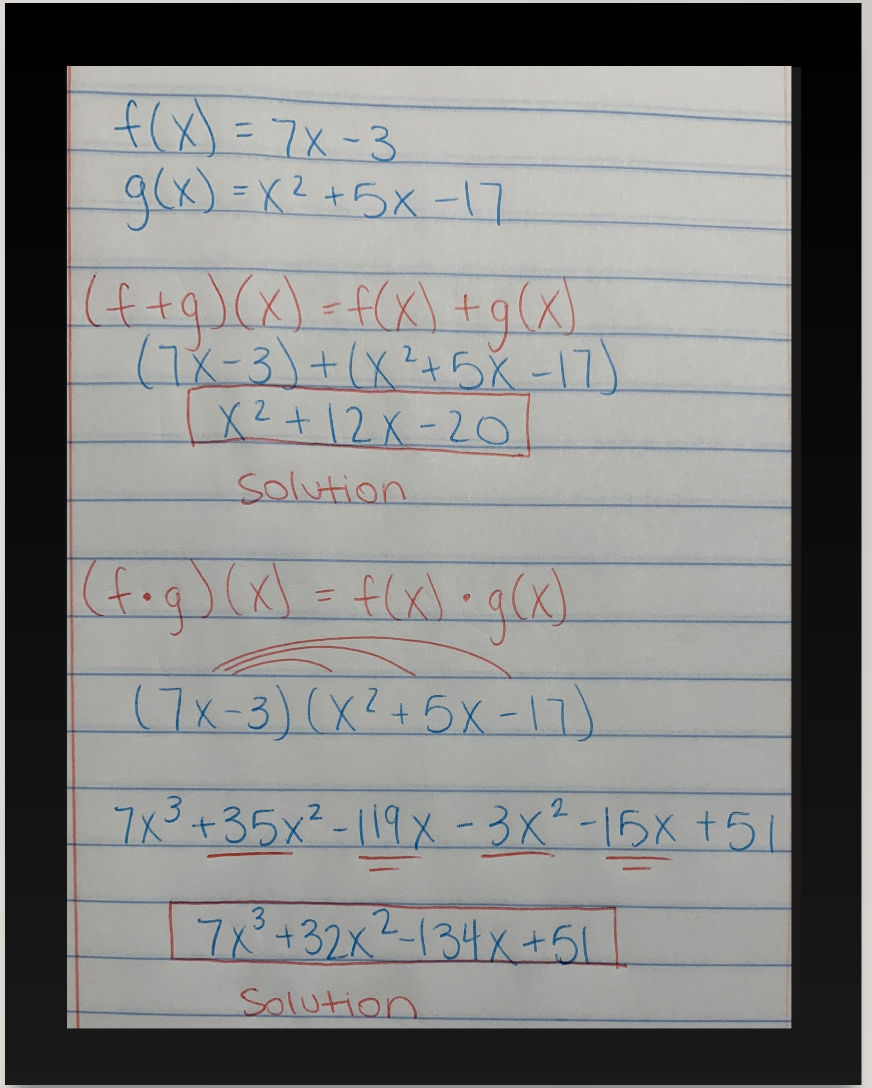
Operations on Functions

Operation	Definition	Example: f(x) = 5x, g(x) = x + 2
Add	$h(x) = f(x) + g(x)$	$h(x) = 5x + (x + 2) = \mathbf{6x + 2}$
Subtract	$h(x) = f(x) - g(x)$	$h(x) = 5x - (x + 2) = \mathbf{4x - 2}$
Multiply	$h(x) = f(x) \cdot g(x)$	$h(x) = 5x(x+2) = \mathbf{5x^2 + 10x}$
Divide	$h(x) = \frac{f(x)}{g(x)}$	$h(x) = \frac{5x}{x+2}$

- A **function** is another way to think of an equation that has an *x* and a *y* value. Think of '*x'* as the input value and '*y' is* the output value, the result we get when we plug *x* into the equation.
- **Function operations** are rules that we follow to solve functions, such as the addition rule, subtraction rule, multiplication rule and division rule.

Function Operations

- To find the sum of the first problem all you have to do is substitute f(x) and g(x) for their values and combine like terms for the solution.
- The second problem is asking for the product. For this problem you have to substitute f(x) and g(x) for their values and use the distributive property. Once you distribute you can combine like terms and find your solution.



REAL-LIFE APPLICATION

- *A soda, snack, or stamp machine*
- The user puts in money, punches a specific button, and a specific item drops into the output slot.
- The function rule is the product price. The input is the money combined with the selected button. The output is the product, sometimes delivered along with coins in change.

REAL-LIFE APPLICATION

- *Miles Per Gallon*
- A car's efficiency in terms of miles per gallon of gasoline is a function. If a car gets 20 mpg, and if you input 10 gallons of gasoline, it will be able to travel roughly 200 miles. The car's efficiency may be a function of the car's design (including weight, tires, and aerodynamics), speed, temperature inside and outside of the car, and other factors.

Real Life Application Example

- Imagine that you want to buy a new car. You get quoted from two dealers: Halpert Honda and Schrute Car Sales. Halpert Honda is selling a 2021 Honda Accord for $24,640. They offer you a special of $1800 cash back.

- At Schrute Car Sales, they have the same car also for $24,640 and a cash back of $1800. However, to win your business, they also will offer a 10% discount.

- Now what you want to find out is this: What will save you more? Receive the cash back first and then take the discount? Or take the discount first and then the cash back?

Real Life Application Example Tools

To solve this, you only really need a pen, paper and maybe a calculator!

Real Life Application Example (cont.)

Using function notation, where *X* is the price of the car, let $f(x)$ represent the price of the car after the cash back and let $g(x)$ represent the price of the car after the discount.

$f(x)$=x-1800 (Rebate of $1800)
g(x)=.90x (Discount 10%)

<u>Rebate First</u>

You can either take the $1800 cash back first and then add the 10% discount...

This can represent this as:

$g(f(24{,}640))$

<u>Discount First</u>

Or you can choose to apply the 10% discount first and then receive the $1800 cash back

This can be represented as:

$f(g(24{,}640))$

Real Life Application Example (cont.)

Using function notation, where X is the price of the car, let $f(x)$ represent the price of the car after the cash back and let $g(x)$ represent the price of the car after the discount.

$f(x)$=x-1800 (Rebate of $1800)
g(x)=.90x (Discount 10%)

Rebate First

$g(f(24{,}640))$

Replace f(x)
g(24,640-1,800)

Subtract to get
=g(22,840)

Now replace g(x)
=.90*22,840

Multiply to get
=$20,556

Discount First

$f(g(24{,}640))$

Replace g(x)
f(.90*24,640)

Multiply to get
=g(22,176)

Now replace f(x)
=22,176-1,800

Subtract to get
=$20,376

CONCLUSION

As we begin to use functions in the real world we are able to understand the relationship within each other. More opportunities will present themselves, and the concept and value of functions can come to light. We constantly come across functions in our daily basis without being aware of it. Operation on functions show us that everything we do is for a reason. Next time you cook, drive, or debate on what purchase is best for you, pay attention on how you use functions.