Section 3 – Topic 3
Adding and Subtracting Functions

Let $h(x) = 2x^2 + x - 5$ and $g(x) = -3x^2 + 4x + 1$.

Find $h(x) + g(x)$.

Find $h(x) - g(x)$.

Let's Practice!

1. Consider the following functions.

$$f(x) = 3x^2 + x + 2$$
$$g(x) = 4x^2 + 2(3x - 4)$$
$$h(x) = 5(x^2 - 1)$$

   a. Find $f(x) - g(x)$.

   b. Find $g(x) - h(x)$.

Try It!

2. Recall the functions we used earlier.

$$f(x) = 3x^2 + x + 2$$
$$g(x) = 4x^2 + 2(3x - 4)$$
$$h(x) = 5(x^2 - 1)$$

a. Let $m(x)$ be $f(x) + g(x)$. Find $m(x)$.

b. Find $h(x) - m(x)$.

BEAT THE TEST!

1. Consider the functions below.

$$f(x) = 2x^2 + 3x - 5$$
$$g(x) = 5x^2 + 4x - 1$$

Which of the following is the resulting polynomial when $f(x)$ is subtracted from $g(x)$?

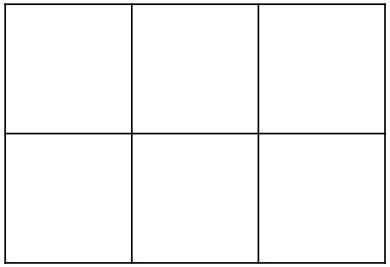
Ⓐ $-3x^2 - x - 4$
Ⓑ $-3x^2 + 7x - 6$
Ⓒ $3x^2 + x + 4$
Ⓓ $3x^2 + 7x - 6$

Section 3 – Topic 4
Multiplying Functions

Use the distributive property and modeling to perform the following function operations.

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

Find $f(x) \cdot g(x)$.



Let's Practice!

1. Hutchinson Square is an urban park in downtown Summerville, South Carolina. Suppose the park is hosting a spring carnival and one of the events will be a treasure hunt. The hunt takes place in a large sandbox. The length of the sandbox in inches, $l(x)$, can be represented by the expression $(x + 12)$, and the width of the sandbox in inches, $w(x)$, can be represented by the expression $(x + 4)$.

   a. Find $w(x) \cdot l(x)$.

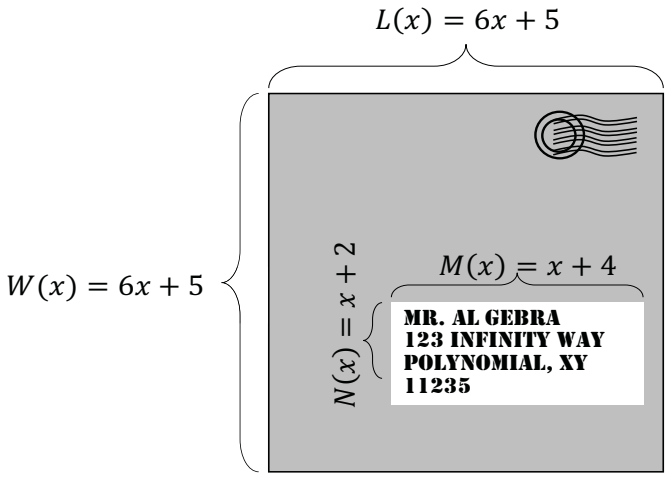
   b. Circle the best answer to complete the following statement.

      The product of $w(x)$ and $l(x)$ is equivalent to the area | elevation | perimeter | volume of the sandbox.

   c. The carnival staff need to be sure they purchase enough sand to completely fill the sandbox. If the height of the box in inches, $h(x)$, can be represented by $(x - 28)$, write an expression to represent the volume of the box.

Try It!

2. The envelope below has a mailing label.



a. Let $A(x) = L(x) \cdot W(x) - M(x) \cdot N(x)$. Find $A(x)$.

b. What does the function $A(x)$ represent in this problem?

BEAT THE TEST!

1. The length of the sides of a square are s inches long. A rectangle is six inches shorter and eight inches wider than the square.

Part A: Express both the length and the width of the rectangle as a function of a side of the square.

Part B: Write a function to represent the area of the rectangle in terms of the sides of the square.

Section 3 – Topic 5
Closure Property

When we add two integers, what type of number is the sum?

When we multiply two irrational numbers, what type of numbers could the resulting product be?

A set is _____ for a specific operation if and only if the operation on two elements of the set ***always*** produces an element of the same set.

Are integers closed under addition? Justify your answer.

Are irrational numbers closed under multiplication? Justify your answer.

Let's apply the closure property to polynomials.

Are the following statements true or false? If false, give a counterexample.

Polynomials are closed under addition.

Polynomials are closed under subtraction.

Polynomials are closed under multiplication.

Let's Practice!

1. Check the boxes for the following sets that are closed under the given operations.

Set	$+$	$-$	$\times$
$\{0, 1, 2, 3, 4, \ldots\}$	☐	☐	☐
$\{\ldots, -4, -3, -2, -1\}$	☐	☐	☐
$\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$	☐	☐	☐
{rational numbers}	☐	☐	☐
{polynomials}	☐	☐	☐

Try It!

2. Ms. Sanabria claims that the closure properties for polynomials are analogous to the closure properties for integers. Mr. Roberts claims that the closure properties for polynomials are analogous to the closure properties for whole numbers. Who is correct? Explain your answer.

BEAT THE TEST!

1. Choose from the following words and expressions to complete the statement below.

$2x^5 + (3y)^{-2} - 2$	$(5y)^2 + 4x + 3y^3$
$5y^{-1} + 7x^2 + 8y^2$	

integers	variables	whole numbers
coefficients	rational numbers	exponents

The product of $5x^4 - 3x^2 + 2$ and _____ illustrates the closure property because the _____ of the product are _____, and the product is a polynomial.

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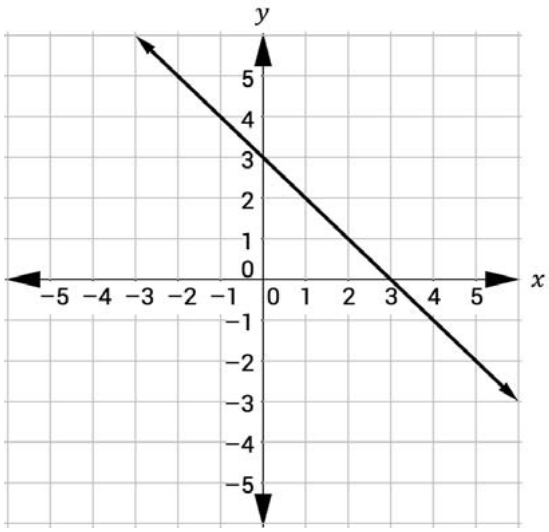
Section 3 – Topic 6
Key Features of Graphs of Functions – Part 1

Let's review the definition of a function.

Every input value (x) corresponds to _____ _____ output value (y).

Consider the following graph.



How can a vertical line help us quickly determine if a graph represents a function?

We call this the ***vertical line test***. Use the vertical line test to determine if the graph above represents a function.