

# 8.1/8.2 Sum/Difference and Product/Quotient of Functions Lesson

This document was composed and formatted by Annie Bernatchez.

The course material originated from [www.jensenmath.ca](http://www.jensenmath.ca)

## Part 1: Sum and Difference of Functions

When two functions  $f(x)$  and  $g(x)$  are combined to form the function  $(f + g)(x)$  or  $(f - g)(x)$ , the new function is called the sum or difference of  $f$  and  $g$ .

The graph of  $f + g$  or  $f - g$  can be obtained by adding or subtracting corresponding  $y$ -coordinates. This is called the **superposition principle**.

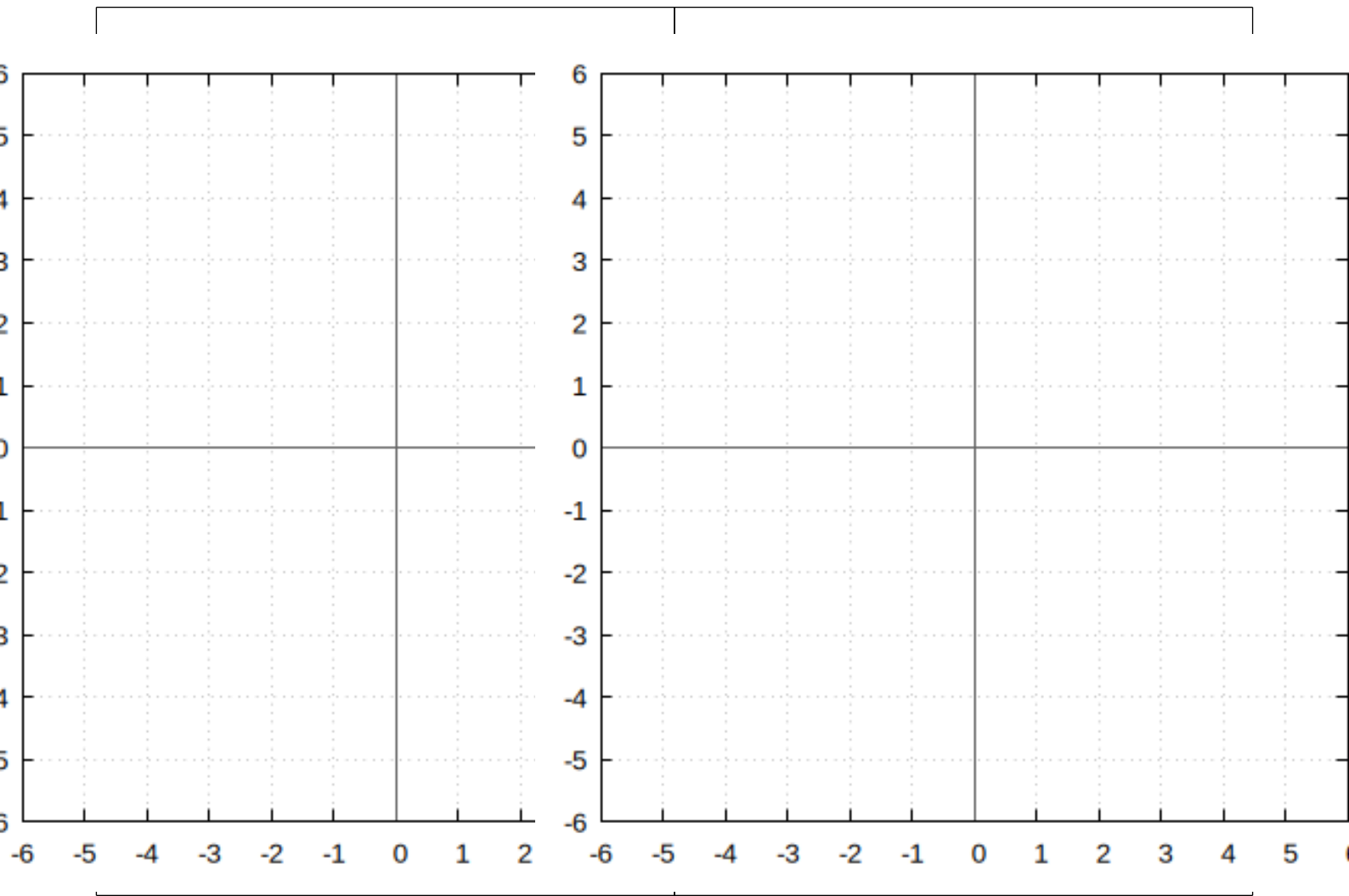
$(f + g)(x) = f(x) + g(x)$

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

**Example 1:** Given  $f(x) = -x^2 + 3$  and  $g(x) = -2x$  determine the graphs of  $(f + g)(x)$  and  $(f - g)(x)$ .

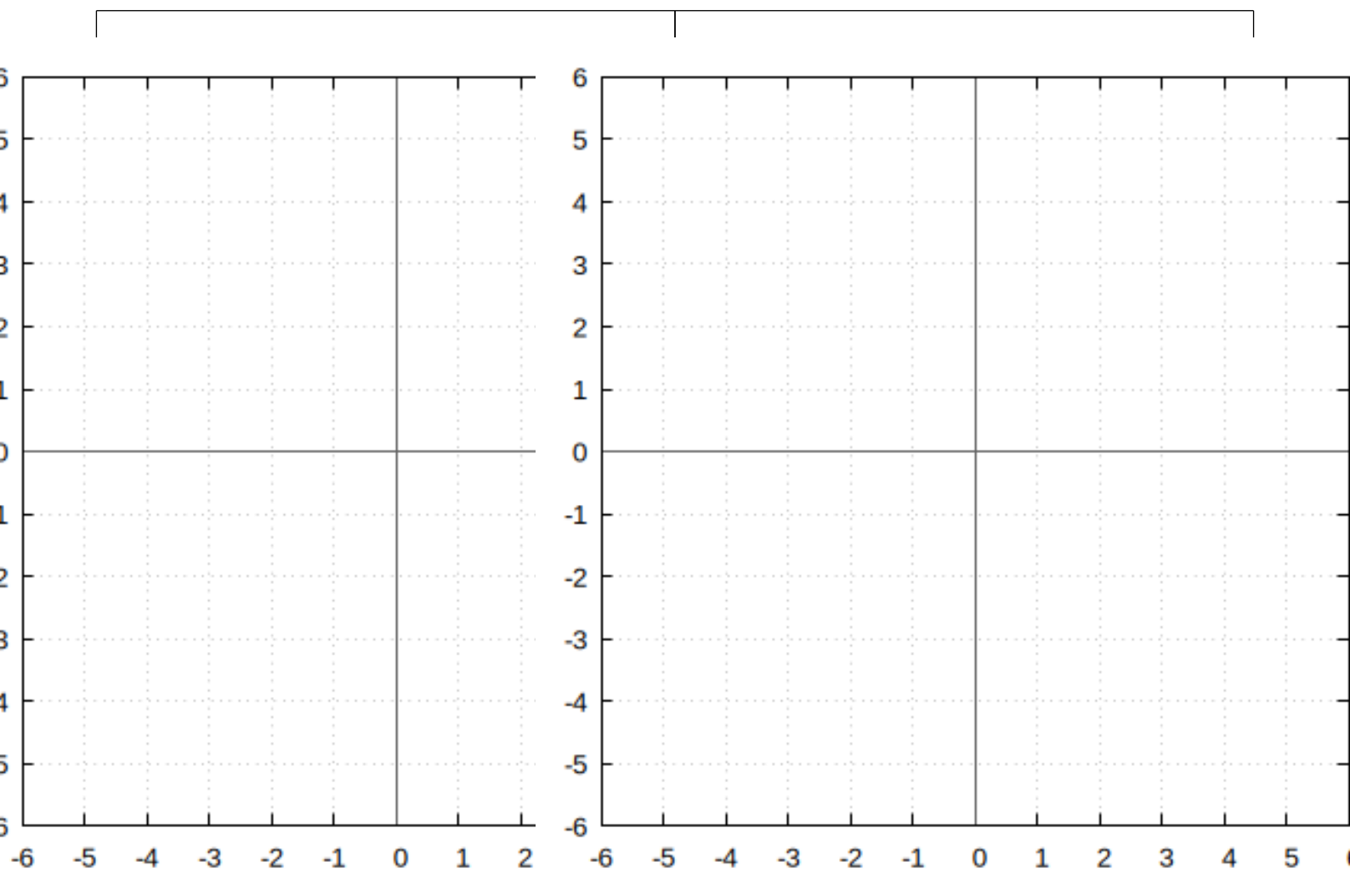
### Method 1: Graphically

| $x$ | $f(x)$ | $g(x)$ | $f(x) + g(x)$ | $f(x) - g(x)$ |
|-----|--------|--------|---------------|---------------|
| -3  |        |        |               |               |
| -2  |        |        |               |               |
| -1  |        |        |               |               |
| 0   |        |        |               |               |
| 1   |        |        |               |               |
| 2   |        |        |               |               |
| 3   |        |        |               |               |



### Method 2: Algebraically

[illegible]



**Note:** The domain of the sum or difference of functions is the intersection of the domains of  $f$  and  $g$ .

## Part 2: Product and Quotient of Functions

When two functions  $f(x)$  and  $g(x)$  are combined to form the function  $(f \cdot g)(x)$  or  $(f \div g)(x)$ , the new function is called the product or quotient of  $f$  and  $g$ .

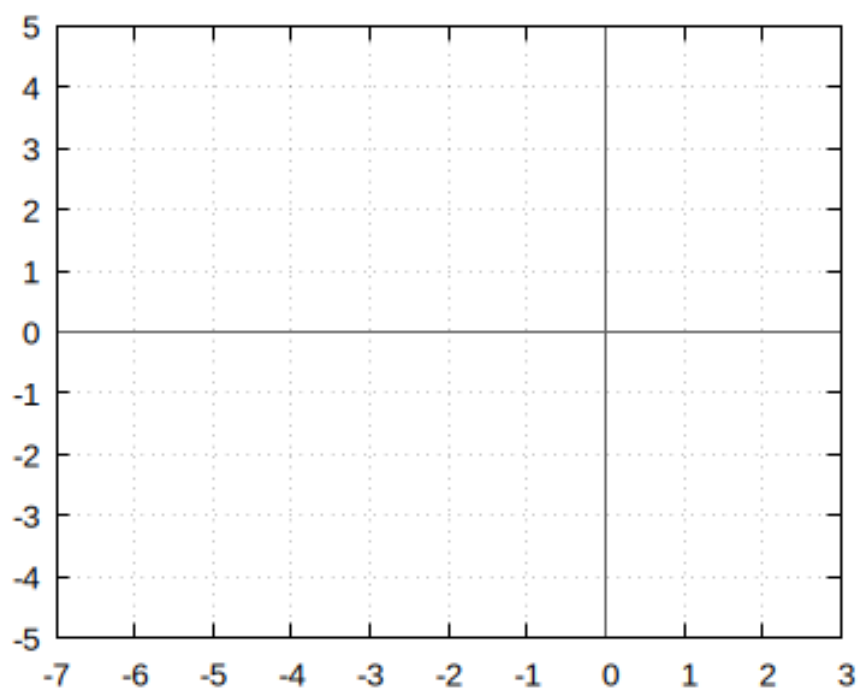
The graph of  $f \cdot g$  or  $f \div g$  can be obtained by multiplying or dividing corresponding  $y$ -coordinates.

$$(f \times g)(x) = f(x) \times g(x)$$

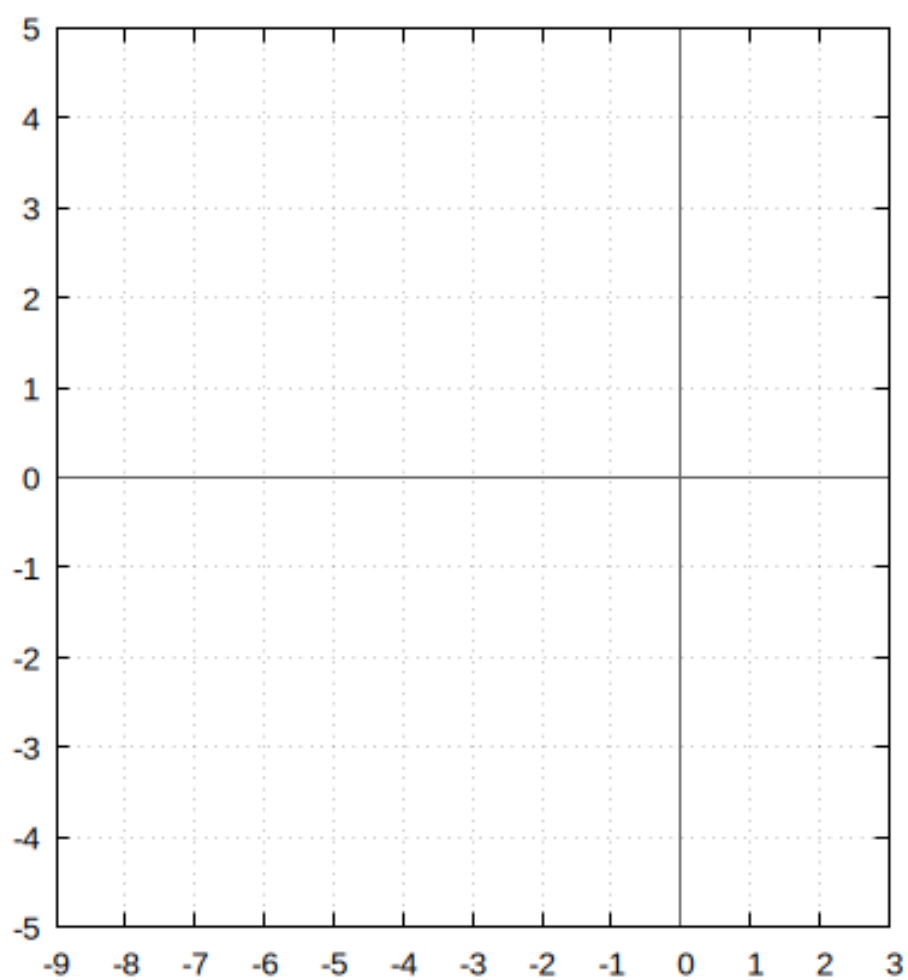
$$(f \div g)(x) = f(x) \div g(x)$$

**Example 2:** Let  $f(x) = x + 3$  and  $g(x) = x^2 + 8x + 15$ . Determine an equation and graph for

a)  $(f \times g)(x)$



b)  $(f \div g)(x)$



c) State the domain and range of both functions