**2.2 Arithmetic Combinations of Functions**

Sum, Difference, Product, and Quotients of Functions

Given: f(x) = 3x + 2 g(x) = x2 – 4

Sum (f + g)(x) = f(x) + g(x)

= (3x + 2) + (x2 – 4)

= x2 + 3x – 2

Difference (f – g)(x) = f(x) – g(x)

= (3x + 2) – (x2 – 4)

= -x2 + 3x + 6

Product (fg)(x) = f(x) g(x)

= (3x + 2) (x2 – 4)

= 3x3 + 2x2 – 12x – 8

f(x)

g(x)

f

g

Not Equal Symbol Images, Stock Photos & Vectors | ShutterstockQuotient (x) = , g(x) 0

3x + 2

x2 - 4

Not Equal Symbol Images, Stock Photos & Vectors | Shutterstock = , x ± 2

|  |  |
| --- | --- |
| More Example | My Example |
| Given: | Given: |
| Sum (f + g)(x) = f(x) + g(x) | Sum (f + g)(x) = f(x) + g(x) |
| Difference (f – g)(x) = f(x) – g(x) | Difference (f – g)(x) = f(x) – g(x) |
| Product (fg)(x) = f(x) g(x) | Product (fg)(x) = f(x) g(x) |
| f(x)  g(x)  f  g  Not Equal Symbol Images, Stock Photos & Vectors | ShutterstockQuotient (x) = , g(x) 0 | f  g  f(x)  g(x)  Not Equal Symbol Images, Stock Photos & Vectors | ShutterstockQuotient (x) = , g(x) 0 |

Example 1

Compute each expression, given that the functions f, g, h, and k are defined as follows:

f(x) = 2x + 1, g(x) = x2 – 2x + 1, h(x) = x3, k(x) = 2

a. (f + g)(x) = f(x) + g(x) = (2x + 1) + (x2 – 2x + 1)

= x2 + 2

b. (h – k)(x) = h(x) – k(x) = x3 – 2

kg

h

c. (3) = k(3) g(3) = 2 [32 – 2(3) + 1]

h(3) 33

= 2 (9 – 6 + 1)

27

= 2 (4)

27

= 8

27

d. (fk)(1) – (hg)(2) = f(1)k(1) – h(2)g(2)

= [2(1) + 1] (2) – (2)3 [22 – 2(2) + 1]

= (2 + 1)(2) – (8)(4 – 4 + 1)

= (3)(2) – (8)(1)

= 6 – 8

= -2

e. [h (f + g)](x) = h(x)[f(x) + g(x)]

= x3 [(2x + 1) + (x2 – 2x + 1)]

= x3 ( x2 + 2)

= x5 + 2x3

More Example

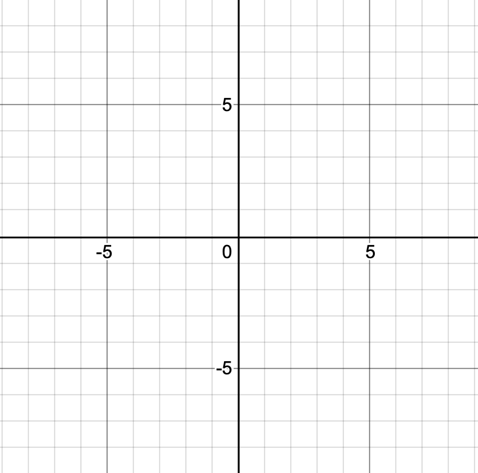
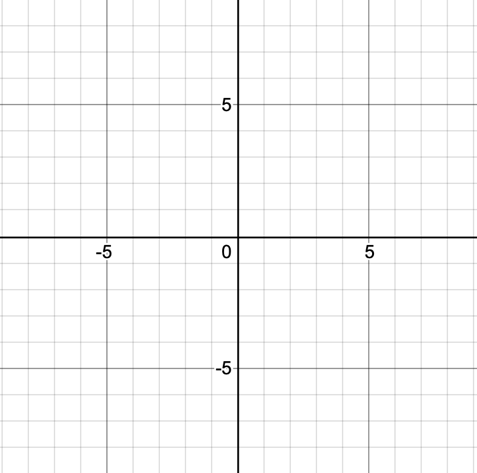
My Example:

Example 2

Use the graphs f, g, and h to evaluate the functions.

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Description automatically generated



y = f(x) y = g(x) y = h(x)

*given x-value*

a. (f +g)(3) = f(3) + g(3)

= - 1 + 1

= 0

*given x-value*

3

-1

h(5)

g(5)

h

g

b. (5) = = = - 3

c. (f g h)(1) = f(1)g(1)h(1)

= (-1)(3)(-1)

= 3

d. Graph: (f – h)(x) = f(x) – h(x)

|  |  |
| --- | --- |
| x | f(x) – h(x) |
| -2 | 2 – (-4) = 6 |
| 0 | 0 – (-2) = 2 |
| 1 | - 1 – (-1) = 0 |
| 2 | -2 – 0 = -2 |
| 4 | 0 – 2 = -2 |
| 6 | 2 – 4 = -2 |