Sec 5-5: Function Operations

- Function Addition
- Function Subtraction
- Function Multiplication
- Function Division
- Composite Functions

Function addition and subtraction is simply combining like terms.

Function multiplication is simply expanding: Distributive Property, FOIL, using the Box..

Defining a function includes describing its DOMAIN.

The domains of $f+g$, $f-g$, and $f \cdot g$ are the intersections of the domains of the individual functions f and g.

- Where the domains of f and g overlap.
- #'s that are in both domains at the same time.

The domains of $f+g$, $f-g$, and $f \cdot g$ are

In general, if you just add or subtract two functions no new restrictions are going to result that weren't already restrictions on the original functions f and g.

This is also usually true of function multiplication but there may be a rare instance when multiplying that a new restriction is created.

State the domains of each:

$f(x) = x^2 + 3x - 1$ Domain: $(-\infty, \infty)$

$g(x) = x + 8$ Domain: $(-\infty, \infty)$

intersection is: $(-\infty, \infty)$

$f+g$ Domain:

$f-g$ Domain:

$f \cdot g$ Domain:

all domains are $(-\infty, \infty)$

State the domains of each:

$f(x) = \dfrac{2}{x+3}$ Domain: $x \neq -3$

$g(x) = x - 7$ Domain: $(-\infty, \infty)$

intersection is: $x \neq -3$

$f+g$ Domain:

$f-g$ Domain:

$f \cdot g$ Domain:

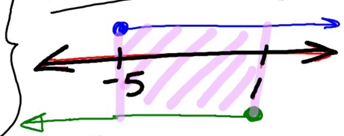
all domains are: $x \neq -3$

State the domains of each:

$f(x) = \sqrt{x+5}$ Domain: $[-5, \infty)$

$g(x) = \sqrt{-(x-1)}$ Domain: $(-\infty, 1]$

intersection is



$[-5, 1]$

$f+g$ Domain:

$f-g$ Domain:

$f \cdot g$ Domain:

all domains are $[-5, 1]$

The domain of $\frac{f}{g}$ is the intersection of

f, g, and $\frac{f}{g}$

State the domains of each:

$f(x) = x^2 + 3x - 1$ Domain: $(-\infty,\infty)$

$g(x) = x + 8$ Domain: $(-\infty,\infty)$

intersection is: $(-\infty,\infty)$

$\frac{f}{g}$ Domain:

since g(x) is now in the denominator there is an additional restriction:

$x \neq -8$

final domain is the combination of $(-\infty,\infty)$ and $x \neq -8$

$\boxed{D: x \neq -8}$

State the domains of each:

$f(x) = \frac{2}{x+3}$ Domain: $x \neq -3$

$g(x) = x - 7$ Domain: $(-\infty,\infty)$

intersection is all real #s except -3: $x \neq -3$

$\frac{f}{g}$ Domain:

since g(x) is now in the denominator there is an additional restriction: $x \neq 7$

final domain is the combination of $x \neq -3$ and $x \neq 7$

$\boxed{D: x \neq -3, 7}$

State the domains of each:

$f(x) = \sqrt{x+5}$ Domain: $[-5,\infty)$

$g(x) = \sqrt{-(x-1)}$ Domain: $(-\infty,1]$

intersection is: $[-5,1]$

$\frac{f}{g}$ Domain:

since g(x) is in the denominator a new restriction

$x \neq 1$

final domain is the combination of $[-5,1]$ and $x \neq 1$

$\boxed{D: [-5,1)}$

Finding the rule for $\frac{f}{g}$

- Factor and simplify. ✓ → we will probably this most of the time.

or

- Perform division.

EXAMPLE 3 Try It! Divide Functions

Page 132

3. Identify the rule and domain for $\frac{f}{g}$ for each pair of functions.

a. $f(x) = x^2 - 3x - 18$, $g(x) = x + 3$ b. $f(x) = x - 3$, $g(x) = x^2 - x - 6$

$f(x) = x^2 - 3x - 18$ Domain: $(-\infty, \infty)$

$= (x-6)(x+3)$

$g(x) = x+3$ Domain: $(-\infty, \infty)$

$\frac{f}{g} = \frac{x^2 - 3x - 18}{x+3} = \frac{(x-6)\cancel{(x+3)}}{\cancel{x+3}}$

$\boxed{\frac{f}{g} = x - 6}$

Domain: g(x) is now a denominator there is a restriction:

$\boxed{D: x \neq -3}$

EXAMPLE 3 Try It! Divide Functions

3. Identify the rule and domain for $\frac{f}{g}$ for each pair of functions.

a. $f(x) = x^2 - 3x - 18$, $g(x) = x + 3$ b. $f(x) = x - 3$, $g(x) = x^2 - x - 6$

$f(x) = x - 3$ Domain: $(-\infty, \infty)$

$g(x) = x^2 - x - 6 = (x-3)(x+2)$ Domain: $(-\infty, \infty)$

$\frac{f}{g} = \frac{\cancel{x-3}}{\cancel{(x-3)}(x+2)} = \frac{1}{x+2}$

$\boxed{\frac{f}{g} = \frac{1}{x+2}}$

Domain: since g(x) is now a denominator there are restrictions

$\boxed{D: x \neq -2, 3}$

Given: $5x + 4y = 12$ and $y = 2x - 3$

Use substitution to write a single equation in terms of x. Simplify.

Given: $5x + 4y = 12$ and $y = 2x - 3$

$5x + 4(2x - 3) = 12$

$5x + 4(2x - 3) = 12$ DISTRIBUTE

$5x + 8x - 12 = 12$ Combine like-terms

$\boxed{13x - 12 = 12}$