7.6 Function Operations

Addition

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

Subtraction

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

Multiplication

$(f * g)(x) = f(x) * g(x)$

Division

$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)},\ g(x) \neq 0$

Domain: All possibe x-values for the function

Domain with Operations: All of the x-values that are in the domain of both f and g. However, the domain of the quotient function does not contain any x-value for which g(x)= 0.

Page 1

Let $f(x) = 5x^2 - 4x$ and $g(x) = 5x + 1$. Find $f+g$ and $f-g$ and their domains.

$$\begin{array}{r} 5x^2 - 4x \\ + 5x + 1 \\ \hline 5x^2 + x + 1 \end{array}$$

$$\begin{array}{r} 5x^2 - 4x \\ - (5x + 1) \\ \hline \end{array}$$

$$\begin{array}{r} 5x^2 - 4x \\ - 5x - 1 \\ \hline 5x^2 - 9x - 1 \end{array}$$

domain : $\mathbb{R}$

Page 2

Let $f(x) = -2x + 6$ and $g(x) = 5x - 7$. Find $f+g$ and $f-g$ and their domains.

$$\begin{array}{r} -2x + 6 \\ + 5x - 7 \\ \hline 3x - 1 \end{array}$$

domain : $\mathbb{R}$

$$\begin{array}{r} -2x + 6 \\ -(5x - 7) \end{array} \Rightarrow \begin{array}{r} -2x + 6 \\ -5x + 7 \\ \hline -7x + 13 \end{array}$$

Page 3

Let $f(x) = 6x^2 + 7x - 5$ and $g(x) = 2x - 1$. Find $f * g$ and $\frac{f}{g}$ and their domains.

	$6x^2$	$7x$	-5
$2x$	$12x^3$	$14x^2$	$-10x$
-1	$-6x^2$	$-7x$	5

$12x^3 + 8x^2 - 17x + 5$

domain: $\mathbb{R}$

$$\frac{6x^2 + 7x - 5}{2x - 1}$$

$\cdot -30 \mid +7$

$10(-3) \mid 10 - 3$

	$3x$	5
$2x$	$6x^2$	$10x$
-1	$-3x$	-5

$2x - 1$

$$\frac{\cancel{(2x-1)}(3x+5)}{\cancel{(2x-1)}}$$

dom: $x \neq \frac{1}{2}$

Page 4

Let $f(x) = x^2 + 1$ and $g(x) = x^4 - 1$. Find $f * g$ and $\frac{f}{g}$ and their domains.

	x^2	$+1$
x^4	x^6	x^4
-1	$-x^2$	-1

$x^6 + x^4 - x^2 - 1$

domain: $\mathbb{R}$

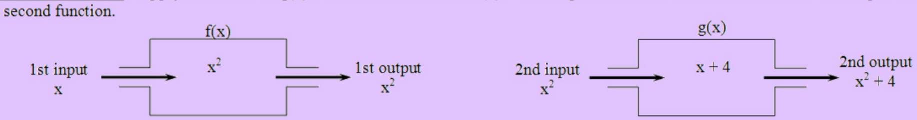
$$\frac{x^2+1}{x^4-1}$$

$$= \frac{\cancel{x^2+1}}{(\cancel{x^2+1})(x^2-1)}$$

$$= \frac{1}{x^2-1} \qquad \text{domain: } x \neq \pm 1$$

Page 5

Composite Function: Apply one function g(x) after another function f(x). The output from the first function becomes the input for the second function.



Composition of Functions: The composition of function g with function f is written as $g \circ f$ and is defined as $(g \circ f)(x) = g(f(x))$

Evaluate the inner function f(x) first

Then use your answer as the input of the outer function g(x).

Page 6

Let $f(x) = x - 2$ and $g(x) = x^2$. Find:

$(f \circ g)(x)$

$f(g(x))$

$f(x^2)$

$x^2 - 2$

$(f \circ g)(-5)$

$f(g(-5))$

$f(25)$

$25 - 2 = 23$

$(f \circ g)(4)$

$f(g(4))$

$f(16)$

$16 - 2 = 14$

$(f \circ g)(-c)$

$f(g(-c))$

$f(c^2)$

$c^2 - 2$

Page 7

Let $f(x) = x^3$ and $g(x) = x^2 + 7$. Find:

$(f \circ g)(x) = x^6 + 21x^4 + 147x^2 + 343$

$f(g(x))$

$f(x^2 + 7) = (x^2 + 7)^3$

	x^4	$+14x^2$	$+49$
x^2	x^6	$14x^4$	$49x^2$
7	$7x^4$	$98x^2$	343

$(f \circ g)(6)$

$f(g(6))$

$f(43)$

$79{,}507$

$(f \circ g)(-3)$

$f(g(-3))$

$f(16)$

$4{,}096$

$(f \circ g)(-m)$

$m^6 + 21m^4 + 147m^2 + 343$

Page 8

Suppose you are shopping. You have a coupon worth $5 off any item and the store has a sale for 20% off the entire stock.

A) Use functions to model each discount

$c(x) = x - 5$ $\qquad$ $p(x) = .8x$

B) Use a composition of your two functions to model how much you would pay for an item if the clerk applies the discount then the coupon.

$c(p(x)) = c(.8x) = .8x - 5$

C)Use a composition of your two functions to model how much you would pay for an item if the clerk applies the coupon then the discount.

$p(c(x)) = p(x-5) = .8(x-5) = .8x - 4$

D) How much more is any item if the clerk applies the coupon first?

$1

homework:

page 394 # 3-42 x 3, (skip 12) 4, 11, 48, 59