Handout for MATH 1300 (Barsamian) Lect. L15 Fri Sep 18: Section 1.8 Algebra of Functions

Part 1: Sum, Difference, Product, and Quotient of Functions

Definition of Sum, Difference, Product, and Quotient of Functions

Given functions f and g, the symbols $f+g$ and $f-g$ and $f \cdot g$ and $\frac{f}{g}$ are functions defined by

$$(f+g)(x) = f(x) + g(x)$$
$$(f-g)(x) = f(x) - g(x)$$
$$(f \cdot g)(x) = f(x) \cdot g(x)$$
$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} \quad \text{provided that } g(x) \neq 0$$

[1] Suppose that $g(x) = -2x^2 + 1$ and $h(x) = 3x - 2$

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

(c) Find $(g-h)(3)$

(b) Find $(g \cdot h)(x)$ two ways. Before starting, ask: Should it matter which method you do?

(i) Method 1: Find $(g \cdot h)(x)$ and then substitute in $x = 3$

(ii) Method 2: Find $g(3)$ and $h(3)$ and then multiply.

(d) Find $\left(\frac{g}{h}\right)(-1)$.

(e) Find all x values that are not in the domain of $\frac{g}{h}$

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Part 2: Variable Expressions as inputs of Functions

[2] (a) Let $f(x) = -6x^2 + 7x$. Find $f(x + 2)$. Simplify your answer as much as possible.

(b) Let $g(x) = \frac{4x+3}{5x+2}$. Find $g\left(\frac{1}{x}\right)$. Simplify your answer as much as possible.

(c) Let $h(x) = \sqrt{x^2 - 8x}$. Find $h(x - 2)$. Simplify your answer as much as possible.

Part 3: Difference Quotients

[3] Let $f(x) = 4x^2 - 3x + 7$

(a) Find $\frac{f(x+h)-f(x)}{h}$. Simplify your answer as much as possible if you don't know anything about the value of h. Hint: You can factor an h out in the numerator, but you cannot cancel $\frac{h}{h}$

(b) Simplify your answer to (a) further given the extra information that $h \neq 0$.

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