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5.1 Combining Functions

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Operations on Functions

For two functions, f and g , we define the new functions

$(f + g)(x) = f(x) + g(x)$ with domain D

$(f - g)(x) = f(x) - g(x)$ with domain D

$(fg)(x) = f(x) \cdot g(x)$ with domain D

$(f/g)(x) = f(x) / g(x)$ with domain D and $g(x) \neq 0$

Where D is the domain that f and g have in common.

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Examples

For the functions given, find $f + g$, $f - g$, fg , and f / g .

A. $f(x) = \frac{1}{x}$, $g(x) = x^3$

B. $f(x) = 6 - x$, $g(x) = \sqrt{x - 4}$

Composition of Functions

For the functions f and g , we define the composition function

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

The domain is all values of x in the domain of g for which $g(x)$ is in the domain of f .

Example

If $f(x) = \sqrt{4-x}$ and $g(x) = x^2$, find

a. $(f \circ g)(x)$

b. $(g \circ f)(x)$

c. $(f \circ f)(x)$

State the domain of each

Example

If $f(x) = \frac{1}{3x}$ and $g(x) = \frac{2}{x-1}$, find

a. $(f \circ g)(x)$

b. $(g \circ f)(x)$

c. $(f \circ f)(x)$

State the domain of each
