Name: ______________________________

Algebra II

Operations on Functions

Past: You have performed arithmetic operations with polynomials.

Present: You can also use addition, subtraction, multiplication and division with functions.

KeyConcept Operations on Functions

Operation	Definition	Example Let $f(x) = 2x$ and $g(x) = -x + 5$.
Addition	$(f + g)(x) = f(x) + g(x)$	$2x + (-x + 5) = x + 5$
Subtraction	$(f - g)(x) = f(x) - g(x)$	$2x - (-x + 5) = 3x - 5$
Multiplication	$(f \cdot g)(x) = f(x) \cdot g(x)$	$2x(-x + 5) = -2x^2 + 10x$
Division	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$	$\frac{2x}{-x + 5}, x \neq 5$

Example 1: **Add and Subtract Functions**

Given $f(x) = x^2 - 4$ and $g(x) = 2x + 1$, find each function.

a. $(f + g)(x)$

b. $(f + g)(2)$

c. $(f - g)(x)$

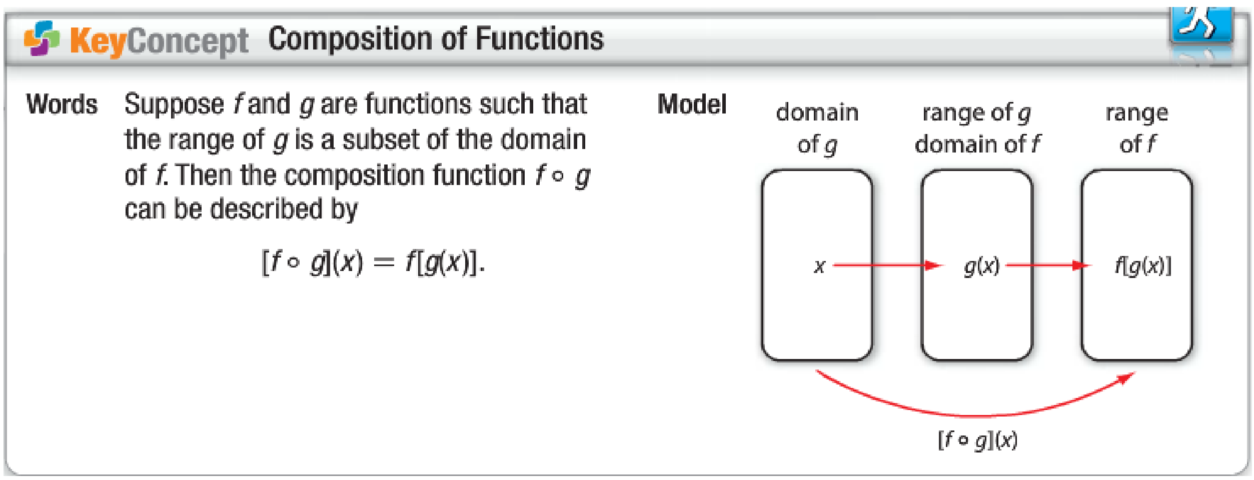
d. $(f - g)(3)$

Example 2: **Multiply and Divide Functions**

Given $f(x) = x^2 + 7x + 12$ and $g(x) = 3x - 4$, find each function.

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

b. $\left(\frac{f}{g}\right)(x)$



KeyConcept **Composition of Functions**

Words Suppose f and g are functions such that the range of g is a subset of the domain of f. Then the composition function $f \circ g$ can be described by

$$[f \circ g](x) = f[g(x)].$$

Model

Example 3: **Composition of Functions given: $f(x) = 3n + 2$ and $g(x) = 2n^2 + 5$**

a. $g(f(2))$

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