

# **Chapter 1**

## **Section 8**

**Composition of Functions**



## OPERATIONS:

- ▶ ADD:  $(f + g)(x) = f(x) + g(x)$
- ▶ SUBTRACT:  $(f - g)(x) = f(x) - g(x)$
- ▶ PRODUCT:  $(f \cdot g)(x) = f(x) \cdot g(x)$
- ▶ QUOTIENT:  $(f/g)(x) = f(x)/g(x)$ 
  - Must find the domains for quotient

## Examples:

$$1.) f(x) = 2x + 1$$

$$g(x) = -3x + 4$$

$$(f+g)(x) = 2x + 1 + -3x + 4$$

$$= -x + 5$$

$$(f \cdot g)(x) = 2x + 1 - (-3x + 4)$$

$$= 2x + 1 + 3x - 4$$

$$= 5x - 3$$

$$(f \cdot g)(x) = (2x + 1)(3x + 4)$$

$$= -6x^2 + 8x - 3x + 4$$

$$= -6x^2 + 5x + 4$$

$$(f/g)(x) = \frac{2x + 1}{-3x + 4}, x \neq 4$$

## Examples

- 2.)  $f(x) = x^2 + 4$   
 $g(x) = 5x - 2$

## Examples

2.)  $f(x) = -2x - 4$

$g(x) = 3x$

$$(f + g)(-2) = (f+g)(x) = -2x - 4 + 3x$$

$$(f+g)(x) = x - 4$$

$$(f+g)(-2) = -2 - 4 = \boxed{-6}$$

$$(f \cdot g)(3) = -10 \cdot 9$$

$$-90$$

# COMPOSITIONS

- $f(x) = x^2 - 1$
- $f(2) = (2)^2 - 1$
- $f(g(x)) = (g(x))^2 - 1$

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

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

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

## EXAMPLES-composition

1.)  $f(x) = 2x + 1$   
 $g(x) = -3x + 4$

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

$(f \circ f)(x) = (x^2 + 4)^3 + 4$   
=  $x^6 + 8x^3 + 16 + 4$   
=  $x^6 + 8x^3 + 20$

2.)  $f(x) = x^2 + 4$   
 $g(x) = 5x - 2$

$(f \circ g)(x) = (5x - 2)^2 + 4$   
=  $25x^2 - 20x + 4 + 4$   
=  $25x^2 - 20x + 8$   
 $(g \circ f)(x) = 5(x^2 + 4) - 2$   
=  $5x^2 + 20 - 2$   
=  $5x^2 + 18$

$$\textcircled{1} \quad (f+g)(x) = \frac{1}{x^2} + \frac{1}{x^2} = \frac{x}{x^2} + \frac{1}{x^2} = \frac{x+1}{x^2}$$

$$(f \cdot g)(x) = \frac{1}{x} \cdot \frac{1}{x^2} = \frac{1}{x^3}$$

$$\left(\frac{f}{g}\right)(x) = \frac{\frac{1}{x}}{\frac{1}{x^2}} = \frac{x^2}{x} = x$$

## Classwork

Pg 89 # 9, 11, 13-21 odd,  
31, 34