7.8 Compositions and Operations with Functions

Warm-Up Friday (notecard)

Complete the square to find the vertex and axis of symmetry of the function.

$f(x) = -2x^2 + 16x - 18$

$-2(x^2 - 8x + 16) - 18 + 32$

$\left(-\frac{8}{2}\right)^2 = (-4)^2$

About Me

1. Who is your favorite famous person?
2. Who is your favorite non-famous person?

7.8 Compositions and Operations with Functions

EQ: How do I perform operations with functions?

Operations with Functions

For two functions $f(x)$ and $g(x)$: "f of x"

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

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

Multiplication: $(fg)(x) = f(x) \cdot g(x)$

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

7.8 Compositions and Operations with Functions

EQ: How do I perform operations with functions?

Example 1: If $f(x)=3x-2$ and $g(x)=x^2-5$, find the following.

a) $(f+g)(x)$ $f(x)+g(x)$ $= (3x-2)+(x^2-5)$ x^2+3x-7 combine like terms

b) $(f-g)(x)$ Distribute Negative $f(x)-g(x) = (3x-2)-(x^2-5)$ $3x-2-x^2+5 = -x^2+3x+3$

c) $(fg)(x)$ FOIL $f(x)\,g(x) = (3x-2)(x^2-5) = 3x^3-15x-2x^2+10$

d) $\left(\frac{f}{g}\right)(x)$ $\frac{f(x)}{g(x)}$ $= \frac{3x-2}{x^2-5}$

7.8 Compositions and Operations with Functions

EQ: How do I perform operations with functions?

Composition of Functions

For two functions $f(x)$ and $g(x)$:

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

"g of f of x"

↑ work from inside out

Note: This means that the domain of $g(x)$ comes from _____.

7.8 Compositions and Operations with Functions

EQ: How do I perform operations with functions?

Example 2: If $f(x) = x^2 - 4$ and $g(x) = x + 3$, find the following:

a) $f(g(-5))$ $= f(-5+3) = f(-2) = (-2)^2 - 4 = 0$

b) $g(f(6))$ $= g((6)^2 - 4) = g(32) = 32 + 3 = 35$

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

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

$x^2 + 3x + 3x + 9 - 4$

$x^2 + 6x + 5$

d) $g(f(x))$

$g(x^2 - 4)$

$(x^2 - 4) + 3$

$x^2 - 1$

7.8 Operations with Functions Name _____

For each of the following functions find:

$f(x)+g(x)$, $f(x)-g(x)$, $f(x)\bullet g(x)$, $\frac{f(x)}{g(x)}$, $f(g(x))$, $g(f(x))$

1. $f(x)=x^2-1$; $g(x)=2x+5$

2. $f(x)=x^2$; $g(x)=\sqrt{x}$

Let $f(x)=x^2-4$ and $g(x)=2x+5$. Find each of the following:

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

4. $(f(x)\bullet g(x))(3)$

5. $\left(\frac{f(x)}{g(x)}\right)(-2)$

6. $f(f(x))$

7. $g(g(-4))$

8. $g(f(-2))$

9. Let $f(x)=3x-2$ and $g(x)=\frac{x^2+1}{2x-5}$, find $f(g(x))$ and $g(f(x))$.

10. Given $g(x)=3x^2-2x+1$, find:

a. $g(0)$ b. $g(-1)$ c. $g(t)$

d. $g(a+h)$ e. $\frac{g(a+h)-g(a)}{h}$ OMIT

11. Given $f(x)=-2x^2+5x-6$, find $\frac{f(a+h)-f(a)}{h}$ OMIT