**Learning Target(s):** I am able to perform the operations addition, subtraction, multiplication, and division with functions. I am able to find the composition of functions. I am able to identify a power function.

## Notes: 6.3 Perform Function Operations and Composition

**Power function** – a function of the form $y=ax^b$ where a is a real number and b is a rational number.

**Composition** – the composition of a function g with a function f is $h(x)=g(f(x))$ The domain is the set of all x values such that x is in the domain of f and f(x) is in the domain of g.

X= domain

**Ex 1:** Let f(x) = $3x^{1/2}$ and g(x) = $-5x^{1/2}$. Find the following.

what's allowed for x?

a. f(x) + g(x)

$3x^{1/2} + -5x^{1/2} = -2x^{1/2}$

$-2\sqrt{x}$

Domain of f + g

$x \geq 0$

b. f(x) – g(x)

$3x^{1/2} + +5x^{1/2} = 8x^{1/2}$ ← doesn't allow negatives

Domain of f – g

$x \geq 0$

**Ex 2:** Let f(x) = 7x and g(x) = $x^{1/6}$. Find the following.

a. f(x) · g(x)

$7x^{1} \cdot 1x^{1/6}$

$\frac{6}{6} 1 + \frac{1}{6} = \frac{7}{6}$

$\boxed{7x^{7/6}}$ ← even root

Domain of $f \cdot g$

$x \geq 0$

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

$\frac{7x^{1}}{x^{1/6}} = \boxed{7x^{5/6}}$ ← even

$1 - \frac{1}{6}$

$\frac{6}{6} - \frac{1}{6} = \frac{5}{6}$

Domain of $\frac{f}{g}$

$x \geq 0$

**Ex 3:** Let $f(x) = 6x^{-1}$ and $g(x) = 3x + 5$. Find the following.

a. $f(g(x))$ * Plug in $\underline{g(x)}$ anytime you see $\underline{x}$ in $\underline{f(x)}$ Domain of $f(g(x))$ $\mathbb{R}$

$f \circ g(x)$

all real numbers

$$6(3x+5)^{-1} = \boxed{\frac{6}{3x+5}}$$

← can't divide by 0

$$3x+5=0$$
$$-5 \quad -5$$
$$\frac{3x}{3} = \frac{-5}{3}$$

except $x = -5/3$

b. $g(f(x))$ * Plug in $\underline{f(x)}$ anytime you see $\underline{x}$ in $\underline{g(x)}$ Domain of $g(f(x))$

$g \circ f(x)$

$$g(x) = 3(6x^{-1}) + 5$$
$$= 18x^{-1} + 5$$
$$= \boxed{\frac{18}{x} + 5}$$

$\mathbb{R}$ except $x = 0$

c. $f(f(x))$ * Plug in $\underline{f(x)}$ anytime you see $\underline{x}$ in $\underline{f(x)}$ Domain of $f(f(x))$

$f \circ f(x)$

$\mathbb{R}$

$$6x^{-1} \quad 6x^{-1}$$

$$6(6x^{-1})^{-1}$$

**Ex 4:** Let $h(x) = \frac{x-2}{5}$ and $f(x) = 3x + 2$. Find $h(f(-9))$.

* Plug in $\underline{-9}$ anytime you see $\underline{x}$ in $\underline{f(x)}$

* Plug in $\underline{\quad}$ anytime you see $\underline{x}$ in $\underline{h(x)}$