Vocabulary:

Solution or solution point: an ordered pair that makes the equation true when substituted in.

Graph of an equation: is the set of all points that are solutions of the equation.

Intercepts: points where the graph intersects or touches the x or y axis.

Rate of Change: shows the relationship between two changing quantities.

Slope: rate of change

Point-Slope Form: an equation of a line without using the y-intercept.

Relation is any set of ordered pairs or anything that has a relationship between it.

Three Common Forms of Relations:
1. Set of Ordered Pairs
2. Graph
3. Mapping Diagram

Function is a one-to-one mapping that establishes a relationship between two numbers.

The collection of all the inputs is called the domain of a function.

Restrictions to the domain can occur:
1.) square roots of negatives
2.) dividing by zero

The collection of all the outputs is called the range of a function.

Funcon Operaons:

Just like with real numbers we can perform four operations with functions.

The four operations we are going to look at are:

1. Addition
2. Subtraction
3. Multiplication
4. Division
Adding and Subtracting Functions:

\[ f(x) = 2x^2 - 1 \]
\[ g(x) = -x^2 + 4 \]

Find the following:

a.) \( (f + g)(x) \)
\[
\frac{f(x) + g(x)}{2x^2 - 1} - \frac{x^2 + 4}{x^2 + 3}
\]

b.) \( (f - g)(x) \)
\[
\frac{f(x) - g(x)}{2x^2 - 1 - x^2 + 4}
\]

\[ 3x^2 - 5 \]

Multiplying and Dividing Functions:

\[ f(x) = 2x^2 - 1 \]
\[ g(x) = -x^2 + 4 \]

\( (f \cdot g)(x) \)
\[
\left(2x^2 - 1\right) \cdot \left(-x^2 + 4\right)
\]

\[ -2x^4 + 9x^2 - 4 \]

Domain: \((-\infty, -2) \cup (-2, 2) \cup (2, \infty)\)

Compositions of Functions:

Find \( f \circ g \) and \( g \circ f \)

\( f(g(x)) = \frac{\sqrt{x^2 + 6} + x}{3} \)

\( g(f(x)) = \sqrt{x^2 + 5} \)

Evaluate the indicated function for \( f(x) = x^2 + 1 \) and \( g(x) = x - 4 \), algebraically.

\[ (f + g)(4) \]
\[ (f - g)(-3) \]

\[ f(4) = 16 + 1 = 17 \]
\[ g(-3) = -7 \]

\( (fg)(2t) \)

\[ f(g(x)) = \frac{\sqrt{x^2 + 5}}{3} \]

\[ g(f(x)) = \sqrt{x^2 + 5} \]

\[ g(f(x)) = \frac{\sqrt{x^2 + 5}}{3} \]

\[ f(g(x)) = \frac{\sqrt{x^2 + 5}}{3} \]

find \( f \circ g \) where

\( f(x) = 6x^2 - 4 \) and \( g(x) = x + 2 \)

\[ f(g(3)) \]

\[ g(3) = 3 + 2 = 5 \]

\[ f(5) = \]
Example 8:
Find two functions $f$ and $g$ such that $h(x) = [f \circ g](x)$ when $h(x) = \frac{1}{x^2}$
Neither function may be the identity function $f(x) = x$

\[
\begin{align*}
  f(g(x)) &= \frac{1}{(3x+2)^2} \\
  g(x) &= x+2 \\
  f(x) &= \frac{1}{x^2} \\
  f(g(0)) &= \frac{1}{32}
\end{align*}
\]

Coursework:

- pg 88 # 5, 13, 16, 18, 20, 24, 26, 39, 43, 57, 70
- pg 98 # 12, 22, 23, 29, 30, 39, 40, 44, 46, 100