Section 1.2 : Combining Functions; Shifting and Scaling Graphs

Chapter 1 : Functions

Math 1551, Differential Calculus

1.2 Combining Functions; Shifting and Scaling Graphs

Topics

We will cover these topics in this section.

1. composite functions
2. sketching functions

Learning Objectives

For the topics in this section, students are expected to be able to:

1. sketch functions using shifting, scaling, reflections
2. compose functions, find the domain and range of the composition

Function Composition

If f, g, are functions, then the **composite** function $f \circ g = f(g(x))$ is

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

$f \circ g$ is defined whenever both g and $f(g)$ are defined.

Example 1
If $f = 1/(x-2)$ and $g = \sqrt{x}$, construct expressions for $f \circ g$ and for $g \circ f$ and find their domains.

Vertical and Horizontal Shifts

Suppose $c > 0$ is a real number.

- $y = f(cx)$ stretches the graph of f by a factor of c units.
- $y = f(x) + c$ shifts the graph of f **up** by c units.
- $y = f(x - c)$ shifts the graph of f **right** by c units.

Example 2

Sketch the graph of $f(x) = 1 + \sqrt{1 + x}$.

Reflections

Reflections are another tool we can use to sketch functions.

- $y = -f(x)$ reflects the graph of f about the x-axis.
- $y = f(-x)$ reflects the graph of f about the y-axis.

Example 3

Sketch the graph of $f(x) = 1 + \sqrt{1 - x}$.