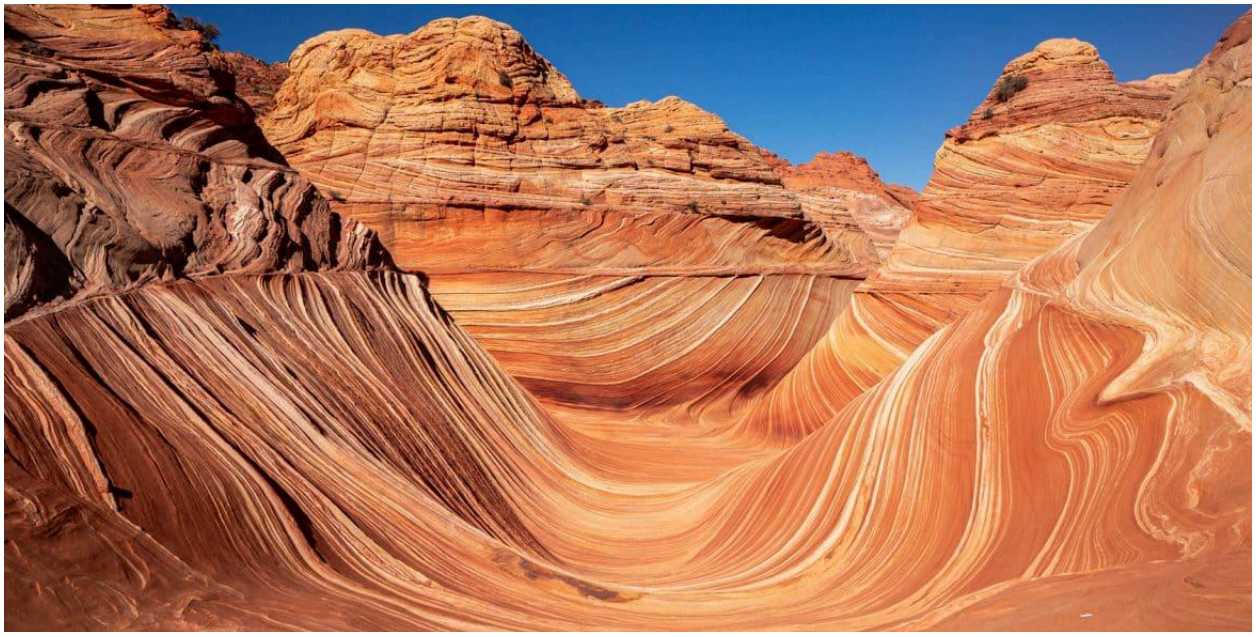
Unit 1: Functions from a Calculus Perspective



Unit 1 Introduction

A function is a mathematical device that converts one value to another in a known way. We can think of it as a machine. You feed the machine an input, it does some calculations on it, and then gives you back another value - the result of the calculations. Students will learn about different properties of functions such as transformations, combinations, graphing, rate of change and using functions for modeling purposes. Functions are used in almost every real life mathematical application. Calculus is deeply concerned with functions, and a thorough understanding of functions is required to be successful in calculus.

Unit Priority Standards

Standard	Skills	Check
IF.C7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	
IF.C6	Calculate and interpret the average rate of change of a function.	
IF.C9	Write a function that describes a relationship between two quantities. Combine standard function types using arithmetic operations.	
BF.A.1.C(+)	Compose Functions	
BF.B.3	Identify and graph function transformations	
BF.B.4	Find inverse functions. Verify by composition that one function is the inverse of another.	

Unit Transfer Goals

- Apply mathematics to problems that arise in everyday life, society, and the workplace.
- Communicate and organize mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate in a professional manner.
- Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Unit Essential questions	
1. How can mathematical ideas be represented? 2. How are symbols useful in mathematics? 3. How are functions used in calculus?	
Acquisition of Knowledge Skill	
Students will know… 1. What a function is 2. The graphs of basic parent functions 3. The various key features of a given function 4. The relationship between a function and its inverse	*Students will be skilled at…*I can... 1. Identify and evaluate functions and state their domains 2. Describe the key features of a function 3. Perform transformations on basic parent functions 4. Compose functions and perform other function operations 5. Find inverse functions algebraically and graphically

Unit Plan

Week 1: 24-27 August	**Focus: Functions** **How can mathematical ideas be represented?**
Learning Target(s):	1.1 Functions 1.2 Analyzing Graphs of Functions and Relations
Acquired Knowledge and Skills:	❑ Identify and evaluate functions and state their domains ❑ Use graphs of functions to estimate function values ❑ Identify even and odd functions
Activities:	Guided Notes Student.desmos.com
Due Dates and Assessments:	All assigned practice is due the next class period.

Week 2: 30 Aug - 3 Sept	**Focus: Key Features of Functions** **How can mathematical ideas be represented?** **How are functions used in calculus?**
Learning Target(s):	1.3 Continuity, End Behavior, and Limits 1.4 Extrema and Average Rate of Change 1.5 Parent Functions and Transformations
Acquired Knowledge and Skills:	❑ Determine continuity and end behavior of functions ❑ Find intervals on which functions are increasing, constant, or decreasing ❑ Identify, graph, and describe parent functions ❑ Identify and graph transformations of functions
Activities:	Guided Notes Student.desmos.com Calculator Technology Lab
Due Dates and Assessments:	All assigned practice is due the next class period.

Week 3: 6-10 Sept	**Focus: Function Operations** **How are symbols useful in mathematics?**
Learning Target(s):	1.6 Function Operations and Composition of Functions 1.7 Inverse Relations and Functions
Acquired Knowledge and Skills:	❑ Perform operations with functions ❑ Find compositions of functions ❑ Use the horizontal line test to determine whether a function has an inverse function ❑ Find inverse functions algebraically and graphically.
Activities:	Guided Notes Student.desmos.com Calculator Technology Lab All assigned practice is due the next class period.
Due Dates and Assessments:	All assigned practice is due the next class period.

Week 4: 13-16 Sept	**Focus: Functions** **How can mathematical ideas be represented?** **How are symbols useful in mathematics?** **How are functions used in calculus?**
Learning Target(s):	❏ Project Day ❏ Unit 1 Test Review
Activities:	Desmos art project Unit Review
Due Dates and Assessments:	Desmos Art Project - October 27

Week 5: 23-24 Sept	**Focus: Functions** **How can mathematical ideas be represented?** **How are symbols useful in mathematics?** **How are functions used in calculus?**
Learning Target(s):	❏ Project Day ❏ Unit 1 Test Review ❏ Unit 1 Test
Activities:	Desmos art project Unit Review Test
Due Dates and Assessments:	Desmos Art Project - October 27 Unit 1 Test - 3rd lesson

Assessment Details

Evidence	
I will check students' understanding throughout the unit by...	
Summative Chapter One Test	**Formative** Desmos Activities

• Assesses skills and knowledge learned in the unit. Desmos art project • Students will demonstrate their knowledge of functions by drawing a picture on the graphing calculator desmos.com.	• Non-graded activities will provide myself and students with information about their understanding. These will also be used as discussion points in class. Q&A • Questions asked randomly to students will help with review and reinforce knowledge. Check-In • Gives students focused feedback on their progress in acquiring skills and knowledge. Discussion • Small group and class discussions provide myself and students with information about their ability to communicate understandings and inferences.

Extended Learning Opportunities

Website Description	Website
Khan Academy: videos & exercises to practice	Khan Academy
Albert IO – Practice Questions	Albert IO
Wolfram Alpha - Mathematical computation engine	Wolfram Alpha