**Barron’s Let’s Review Regents – Algebra II**

# Chapter 7: Functions

## 7.1 Composite Functions

**Key Ideas**

A function is a mathematical rule that generally takes a number input and then outputs a number. If the function is called f, the notation means that when the number 4 is put into the function, the number 11 is output from the function. Functions can be used to describe mathematical relationships, including real-world scenarios.

Functions are often defined by a formula. For example, the formula means that when a number is put into the function, a number that is three more than twice that number will come out of the function. So .

Not only can numbers be put into a function but so can variables or even other functions. Using the function defined above, and .

If another function is defined as , it is possible to create a new function . By putting into the function, the new function becomes .

When a function is put into another function, the result is called a composite function. When working with composite functions, start with the inner function first and then move to the outer function.

**Example 1**

If and , what is the value of ?

*Solution*:

Since .

**Example 2**

If and , what are and ?

*Solution*:

Notice that in this example, is not equivalent to .

**Example 3**

If and , what is ?

Solution:

More difficult than finding the composition of two given functions is trying to find two functions whose composition would become some given function. For example, could be *decomposed* into where and . There are other ways to decompose this function into two functions also, but this way is the most useful.

**Example 4**

Which of the following could be and if

(1)

(2)

(3)

(4)

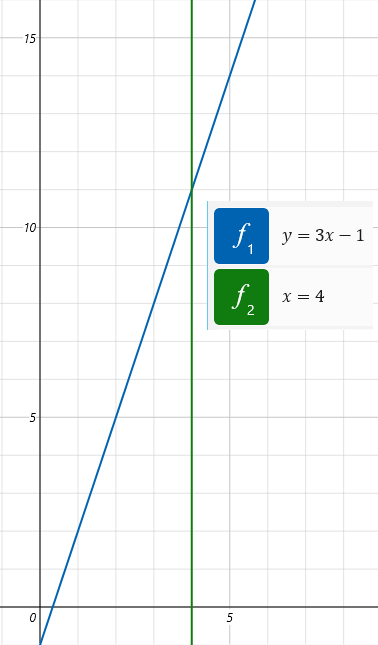
*Solution*: Choice (2) is correct since   
. If you test choice (1), it would be come .

**Composite Functions on the Graphing Calculator**

Graphing calculators can also evaluate functions and composite functions.

Evaluate the function at .

**Using Microsoft Windows Calculator and Microsoft Paint**



**Using Geogebra**

A graph of a line

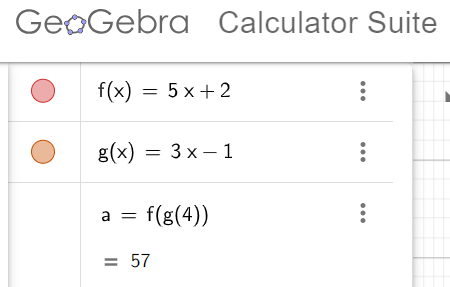
AI-generated content may be incorrect.

A screenshot of a calculator suit

AI-generated content may be incorrect.

To evaluate composite functions like when and , both functions need to be entered into the calculator.

**Using Geogebra**



**Odd and Even Functions**

A function is called an *even* function if its graph has -axis symmetry. A function is called an odd function if its graph has *origin* symmetry. The graphs of most functions have neither of these symmetries and so are neither odd nor even.

**Average Rate of Change**

A function has something called the average rate of change on an interval. This is very similar to the concept of slope discussed in Chapter 1.

The formula for the average rate of change of the function on the interval to is shown:

**Example 5**

What is the average rate of change of the function on the interval ?

*Solution*: Use the formula:

**End Behavior of Functions**

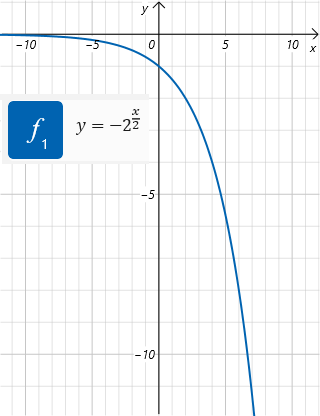
The end behavior of a function is a description of what output values happen when very large positive or very negative values are put into the function. When a large number is put into the function   
, for example , the function outputs a very large positive number.

Using symbols, we write: As , where the means infinity.

When a large negative number is put into the same function, like , the function outputs a very large positive number.

Using symbols, we write: As .

The end behavior can be seen on the graph of the function.



For large positive input values, this function outputs a large negative number. For large negative input values, this function outputs a number close to zero.

The end behavior of this function can be described:

As   
As

### Check Your Understanding of Section 7.1

1. *Multiple-Choice*
2. If and , what is ?  
   **(3) 25**
3. If and , what is ?  
   **(2) 7**
4. Which of the following could be and if **(1)**
5. If , what is ?  
   **(4) Not enough information to answer**
6. If , what is ?  
   **(4)**
7. If , what is the value of?  
   **(1) 126**
8. If , what is ?  
   **(1)**
9. If , what is g(f(x))?  
   **(3)**
10. If and , what is g(x)?  
    **(4)**
11. If , what is the value of ?  
    **(3) 26**
12. *Show how you arrived at your answers*.
13. and . Griffin says . Ruben says . Who is correct?  
    **Griffin is correct.  
    Book answer is partially incorrect. Book says Griffin is correct. 17 is not correct.**
14. If , and , what is ?
15. Given the two graphs of and , what is the value of ?  
      
    A graph of a line with points

    AI-generated content may be incorrect.  
      
    A graph of a function

    AI-generated content may be incorrect.  
       
       
    Points: (0, -3), (2, 1)  
    -intercept: (0, -3)   
       
       
      
     parabola  
       
       
       
    Points: (0, 1), (1, 2), (-1, 2)  
       
       
      
       
    **I disagree with the book’s answer. . You can see it on the graph that .**A screenshot of a calculator

    AI-generated content may be incorrect.
16. If and the graph of is shown below, what does the graph of look like?  
      
    A graph of a function

    AI-generated content may be incorrect.

|  |  |  |
| --- | --- | --- |
| **x** | **g(x)** | **f(g(x))** |
| 0 | 0 | 2 |
| 2 | 5 | 7 |
| 7 | 5 | 7 |
| 9 | 0 | 2 |
| 11 | 8 | 10 |

A graph of a function

AI-generated content may be incorrect.

1. If and , for what value(s) of does ?