



### Multiplications of Functions

Students will find the product of two functions. Students are given a rule to follow and asked to apply the rule. On page 1.4, students can verify their answers.

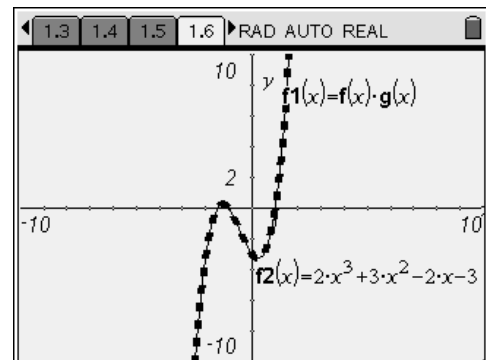
Algebraic Solution

Step 1:  $(f \cdot g)(x) = f(x) \cdot g(x)$

Step 2:  $(f \cdot g)(x) = (2x + 3) \cdot (x^2 - 1)$

Step 3:  $(f \cdot g)(x) = 2x^3 + 3x^2 - 2x - 3$

Students will learn how to support their solution graphically. If the graph of  $f(x) \cdot g(x)$  coincides with the graph of the product students found, then their product is supported.



Students are asked to evaluate  $f(x)$ ,  $g(x)$ , and their product function at a few  $x$ -values to show one more way that the products are equivalent.

Defined Functions

$f(x) = 2x + 3$

$g(x) = x^2 - 1$

$f_1(x) = f(x) \cdot g(x)$

$f_2(x) = 2x^3 + 3x^2 - 2x - 3$

Evaluate at  $x = -4$  and  $x = 7$ .

$f(-4) \cdot g(-4)$	-75
$f_1(-4)$	-75
$f_2(-4)$	-75
$f(7) \cdot g(7)$	816
$f_1(7)$	816
$f_2(7)$	816

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### Division of Functions

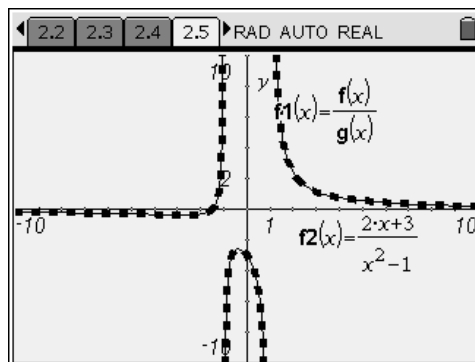
Students are given the rule for  $\frac{f}{g}(x)$  and asked to apply this rule. Students can verify their answers on page 2.3.

Algebraic Solution

Step 1:  $\frac{f}{g}(x) = \frac{f(x)}{g(x)}$

Step 2:  $\frac{f}{g}(x) = \left( \frac{2x + 3}{x^2 - 1} \right)$ , where  $x \neq -1, 1$

Students will once again support their answers graphically.



Students evaluate the functions for a few  $x$ -values.

Defined Functions	$f(7)$	$g(7)$	$f1(7)$	$f2(7)$
$f(x) = 2x + 3$	17	48	17	48
$g(x) = x^2 - 1$	48			
$f1(x) = \frac{f(x)}{g(x)}$			17	48
$f2(x) = \frac{2x + 3}{x^2 - 1}$				17

Students will later complete a few practice problems on their own.

**Student Exercise Solutions**

- $(f \cdot g)(x) = 3x^3 - x^2 - 15x + 5$
- $\frac{f}{g}(x) = x + 5$ , when  $x \neq 5$

Multiplication & Division of Functions – ID: 10218

(Student)TI-Nspire File: *PreCalcAct29\_MultDivFxnS\_EN.tns*

**MULTIPLICATION & DIVISION OF FUNCTIONS**

Precalculus  
Multiplying and dividing functions

The product of functions  $(fg)(x)$  can be defined by the rule:  
 $(fg)(x) = f(x) \cdot g(x)$

**Question**  
Using the rule, what is  $(fg)(x)$  when  $f(x) = 2x + 3$  and  $g(x) = x^2 - 1$ ?

**Answer**

Algebraic Solution  
Step 1:  $(fg)(x) = f(x) \cdot g(x)$   
Step 2:  $(fg)(x) = (2x + 3) \cdot (x^2 - 1)$   
Step 3:  $(fg)(x) = 2x^3 + 3x^2 - 2x - 3$

On the next page, graphically verify  $(fg)(x) = f(x) \cdot g(x)$ . Enter your function  $(fg)(x)$  in **f2** on the next page. If your product is correct, then the graph of **f2** should coincide with the graph of  $f(x) \cdot g(x)$ .

$f1(x) = f(x) \cdot g(x)$

1.4 1.5 1.6 1.7 ▸ RAD AUTO REAL

Defined Functions

$f(3), g(3)$	72
$f1(3)$	72
$f2(3)$	72

$f(x) = 2x + 3$   
 $g(x) = x^2 - 1$   
 $f1(x) = f(x) \cdot g(x)$   
 $f2(x) = 2x^3 + 3x^3 - 2x - 3$

Evaluate at  $x = -4$  and  $x = 7$ .

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1.5 1.6 1.7 2.1 ▸ RAD AUTO REAL

The quotient of functions  $\frac{f(x)}{g(x)}$  can be defined by the rule:

$$\frac{f(x)}{g(x)} = \frac{f(x)}{g(x)}$$

1.6 1.7 2.1 2.2 ▸ RAD AUTO REAL

**Question**

Using the rule, what is  $\frac{f(x)}{g(x)}$  when  $f(x) = 2x + 3$  and  $g(x) = x^2 - 1$ ?

**Answer**

1.7 2.1 2.2 2.3 ▸ RAD AUTO REAL

Algebraic Solution

Step 1:  $\frac{f(x)}{g(x)} = \frac{f(x)}{g(x)}$

Step 2:  $\frac{f(x)}{g(x)} = \frac{2x + 3}{x^2 - 1}$ , where  $x \neq -1, 1$

2.1 2.2 2.3 2.4 ▸ RAD AUTO REAL

On the next page, verify that  $\frac{f(x)}{g(x)} = \frac{f(x)}{g(x)}$  graphically. Enter your function  $\frac{f(x)}{g(x)}$  in **f2** on the next page. If your quotient is correct, then the graph of **f2** should coincide with the graph of  $\frac{f(x)}{g(x)}$ .

2.2 2.3 2.4 2.5 ▸ RAD AUTO REAL

$f1(x) = \frac{f(x)}{g(x)}$

$f2(x) =$

2.3 2.4 2.5 2.6 ▸ RAD AUTO REAL

Defined Functions

$f(3)$	9
$g(3)$	8
$f1(3)$	9
$f2(3)$	8

$f(x) = 2x + 3$   
 $g(x) = x^2 - 1$   
 $f1(x) = \frac{f(x)}{g(x)}$   
 $f2(x) = \frac{2x + 3}{x^2 - 1}$

Evaluate at  $x = -4$  and  $x = 7$ .

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2.4 2.5 2.6 3.1 ▸ RAD AUTO REAL

Given  $f(x) = 3x - 1$  and  $g(x) = x^2 - 5$ , determine  $(fg)(x)$ . Then verify your function graphically.

To graphically verify your solution, start by defining the functions  $f(x)$  and  $g(x)$  on page 3.3. Then, enter your function  $(fg)(x)$  in **f1(x)** on page 3.4.

2.5 2.6 3.1 3.2 ▸ RAD AUTO REAL

**Question**

What is  $(f + g)(x)$  when  $f(x) = 3x - 1$  and  $g(x) = x^2 - 5$ ?

**Answer**

2.6 3.1 3.2 3.3 ▸ RAD AUTO REAL

Define  $f(x)$  and  $g(x)$  below.

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3.1 3.2 3.3 3.4 ▸ RAD AUTO REAL

$f1(x) =$

3.2 3.3 3.4 4.1 ▸ RAD AUTO REAL

Given  $f(x) = x^2 - 25$  and  $g(x) = x - 5$ , determine  $\frac{f(x)}{g(x)}$ . Verify graphically.

Define the functions  $f(x)$  and  $g(x)$  on page 3.3. Then enter your function  $\frac{f(x)}{g(x)}$  in **f1(x)** on page 3.4.

3.3 3.4 4.1 4.2 ▸ RAD AUTO REAL

**Question**

What is  $\frac{f(x)}{g(x)}$  when  $f(x) = x^2 - 25$  and  $g(x) = x - 5$ ?

**Answer**

3.4 4.1 4.2 4.3 ▸ RAD AUTO REAL

Define  $f(x)$  and  $g(x)$  below.

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4.1 4.2 4.3 4.4 ▸ RAD AUTO REAL

$f1(x) =$