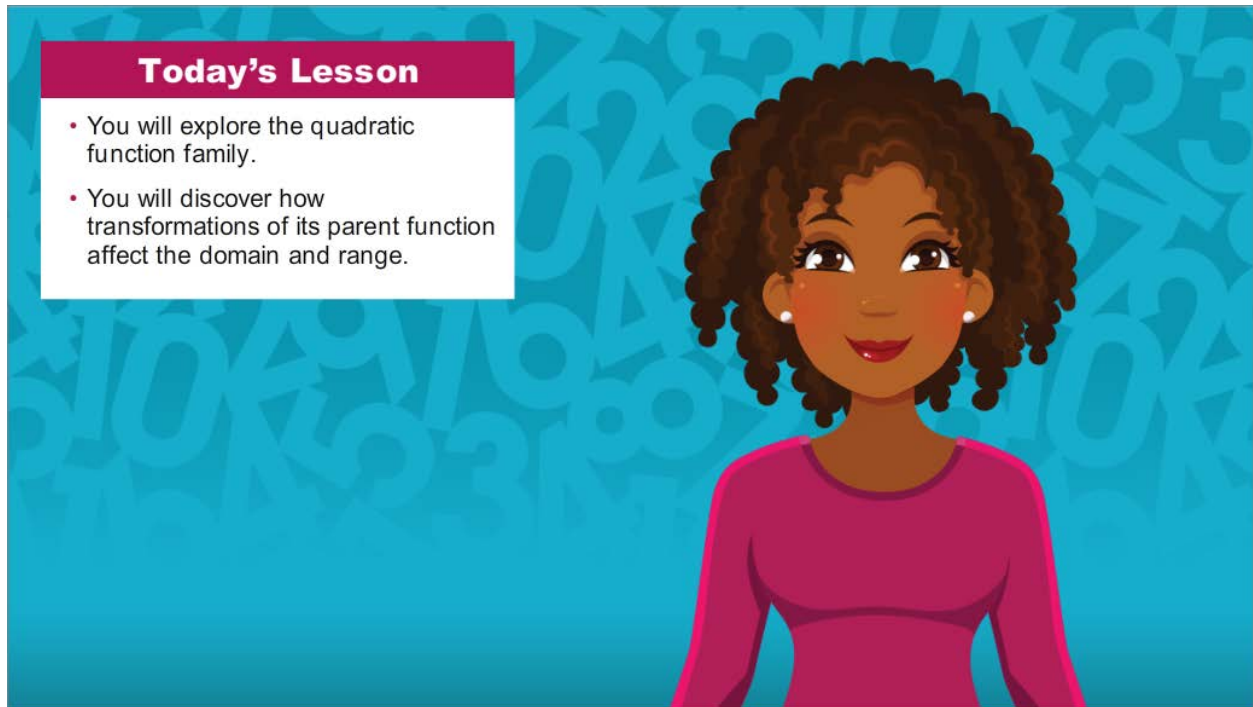


Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Introduction



Today's Lesson

- You will explore the quadratic function family.
- You will discover how transformations of its parent function affect the domain and range.

Hi there! I'm so glad you could join me for this lesson in Algebra I, where you will explore the quadratic function family and discover how transformations of its parent function affect the domain and range.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Exploring Quadratic Functions

EXPLORING QUADRATIC FUNCTIONS

Click the Examples Below to Learn More

Example One

Example Two

Example Three

Self-Check

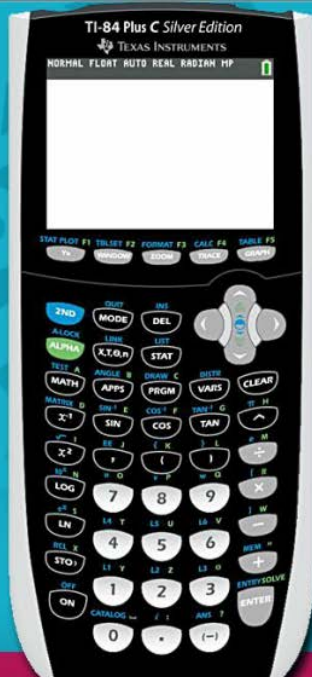
Click the examples below to learn more.

- Example One
- Example Two
- Example Three
- Self-Check

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 1



A TI-84 Plus C Silver Edition graphing calculator is shown on the left. The screen is blank. To the right of the calculator is a white box with a grey border containing the text for Example 1.

Example 1

Use the graphing calculator to investigate the parent function of the quadratic function family.

$$f(x) = x^2$$

Images used with permission by Texas Instruments Incorporated.

Use the graphing calculator to investigate the parent function of the quadratic function family.

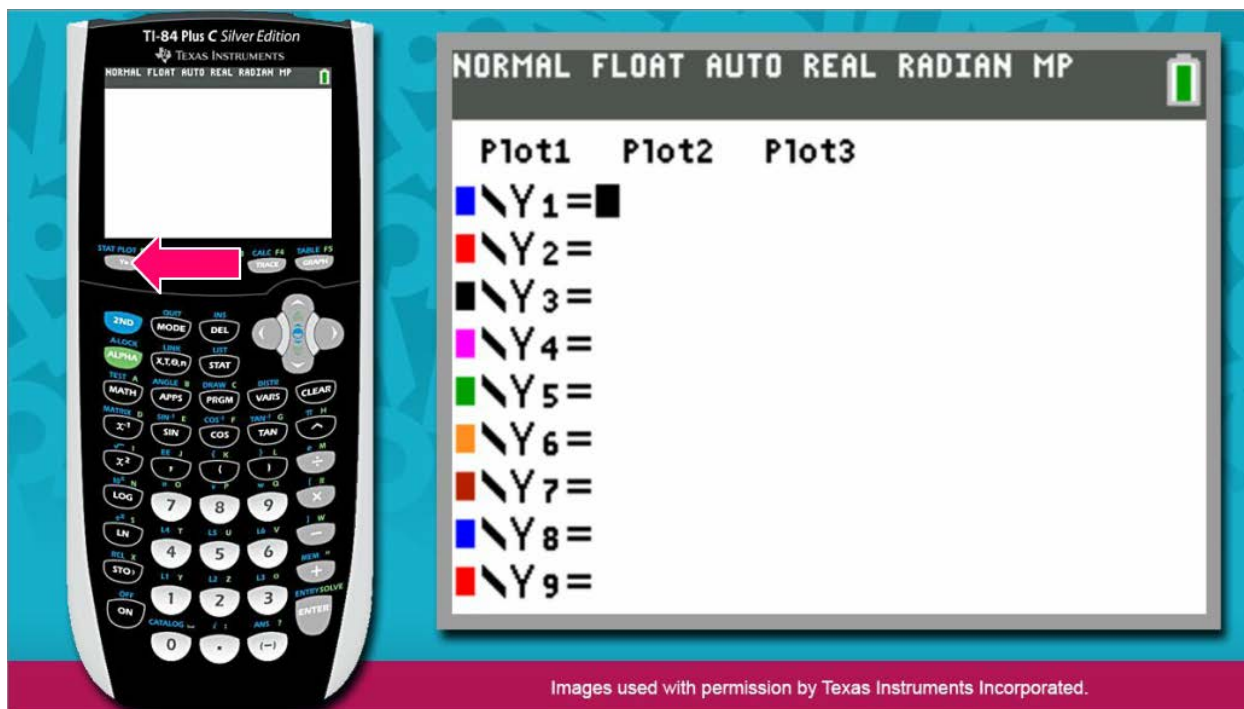
$$f(x) = x^2$$

The parent function of the quadratic function family is $f(x) = x^2$. Enter the function into the graphing calculator.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 1 (continued)

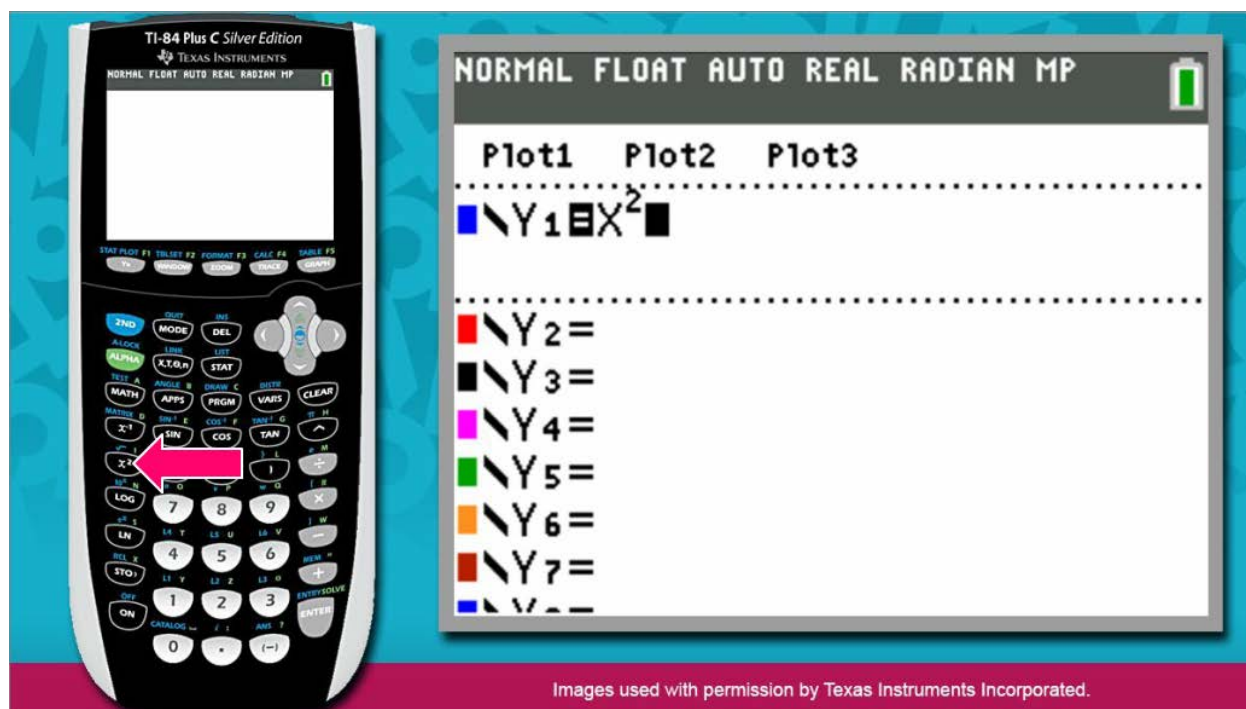


Press the Y= key.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 1 (continued)



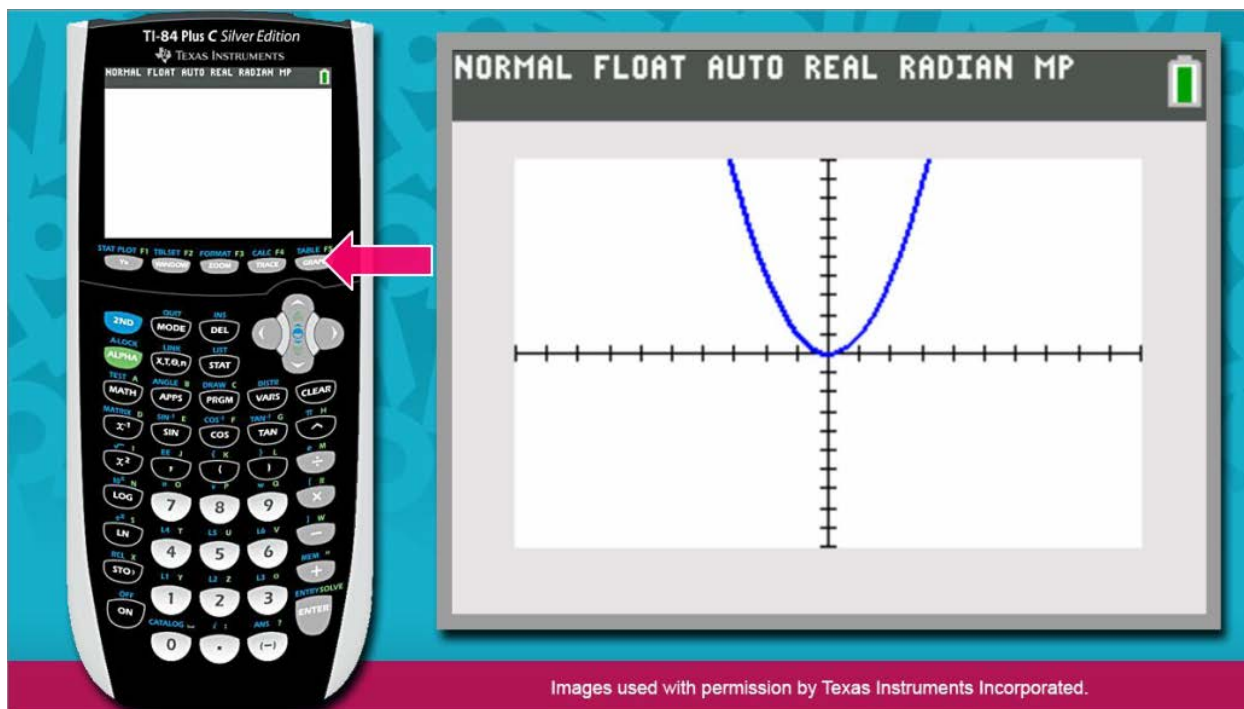
Now, enter x^2 to the right of Y_1 . Press the key to the right of the green ALPHA key to type the variable x .

Then, press the x^2 key located a few keys below the green ALPHA key.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 1 (continued)

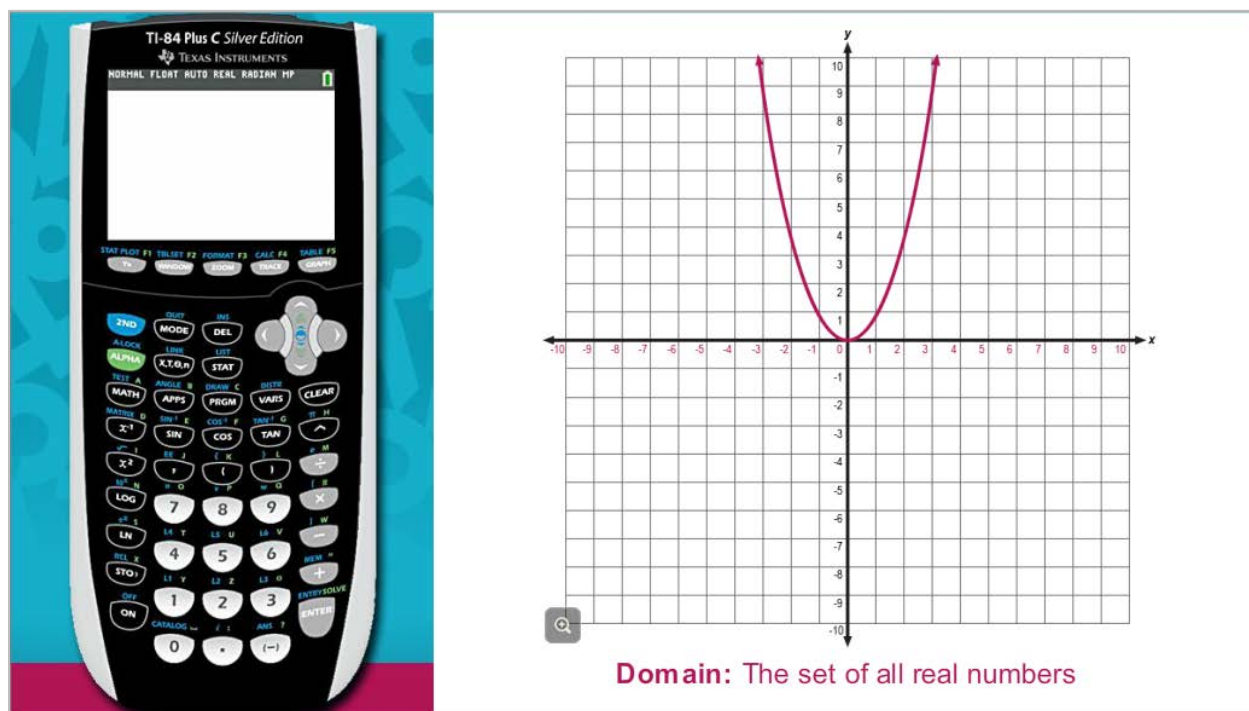


Now, press GRAPH.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 1 (continued)

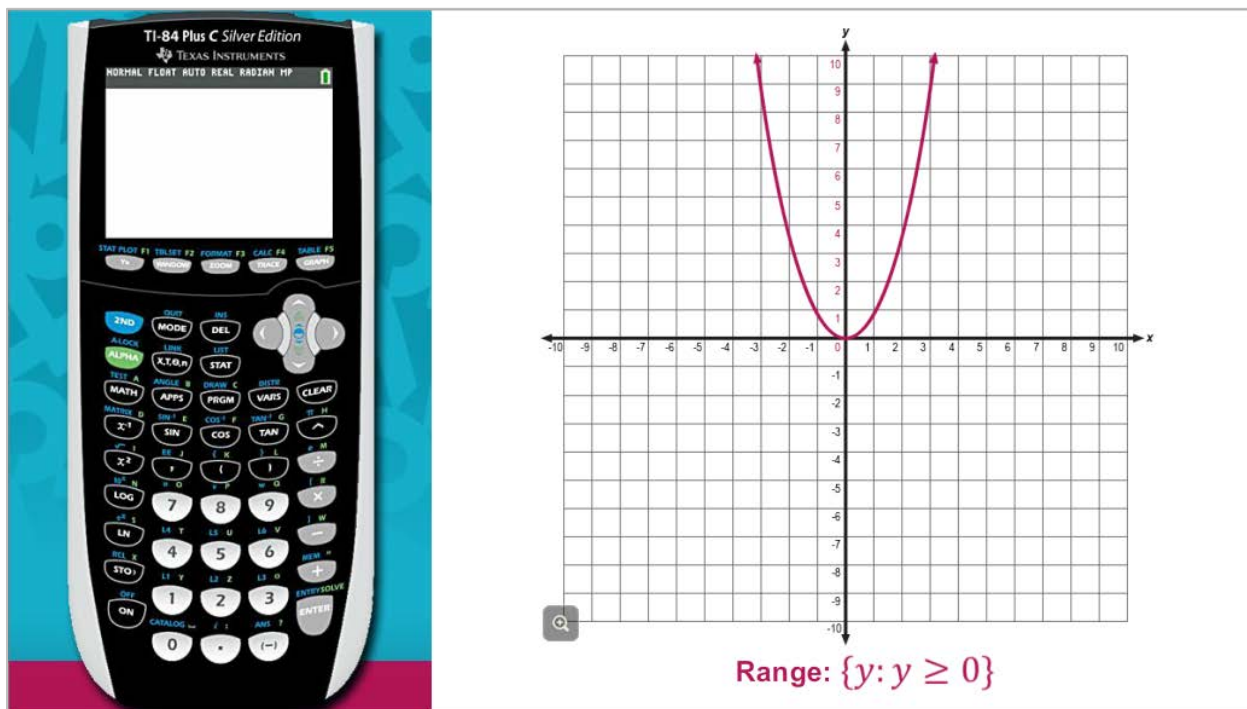


Notice that the function is defined for all values of x . Or in other words, a y -value exists for all possible values of x – all negative values, 0, and all positive values. Therefore, the domain of the quadratic parent function is the set of all real numbers.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 1 (continued)

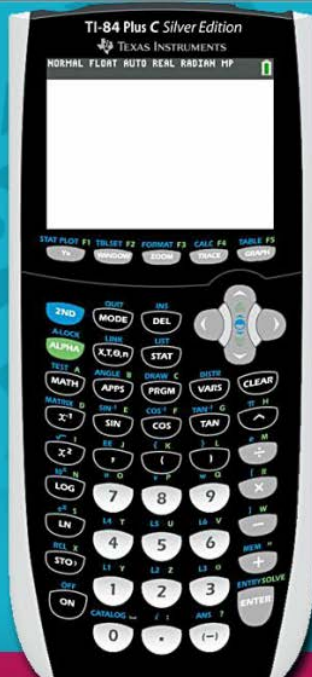


Notice that all of the output values of the parent function are greater than or equal to 0. You can use set notation to represent the range as: $\{y: y \geq 0\}$.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 2



A TI-84 Plus C Silver Edition graphing calculator is shown on the left. The screen is blank. The calculator has a black face with silver accents and a large LCD screen at the top. The keypad includes various function keys like MODE, DEL, STAT, MATH, APPS, PRGM, VARS, CLEAR, and a numeric keypad.

Example 2

Use the graphing calculator to discover how vertical translations of the parent function affect the domain and range.

$$j(x) = x^2 + 3$$

Images used with permission by Texas Instruments Incorporated.

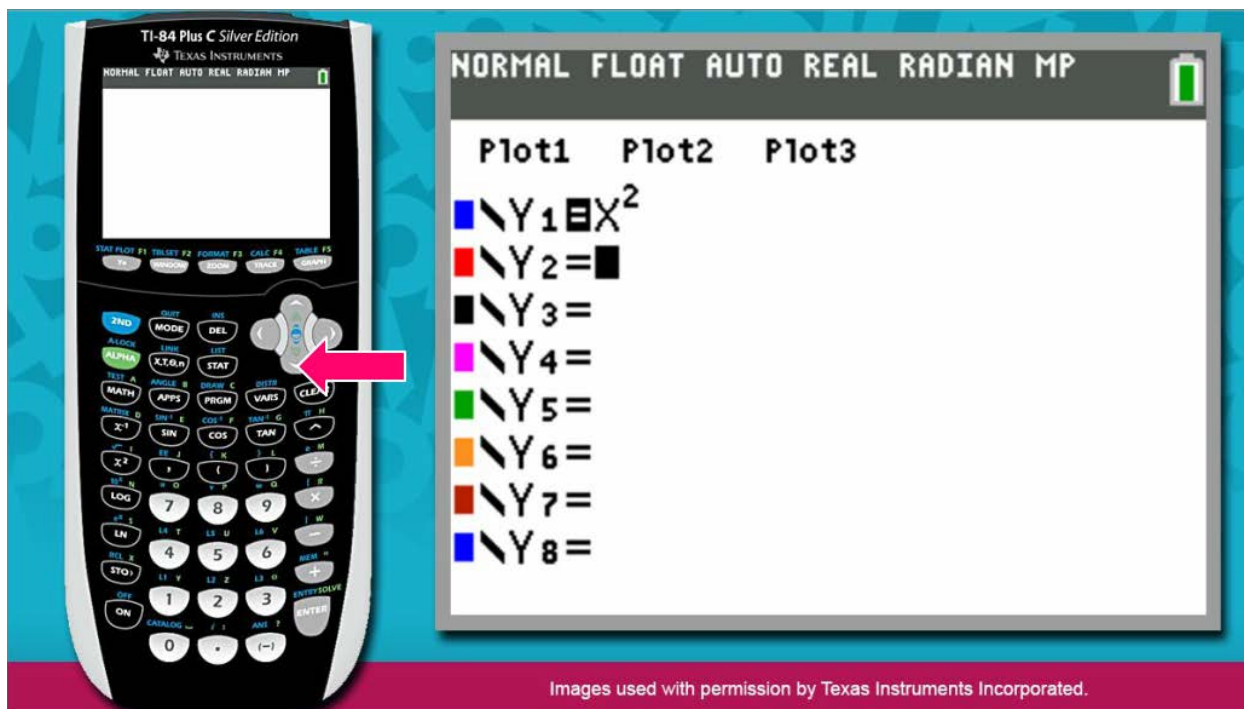
Use the graphing calculator to discover how vertical translations of the parent function affect the domain and range.

$$j(x) = x^2 + 3.$$

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)

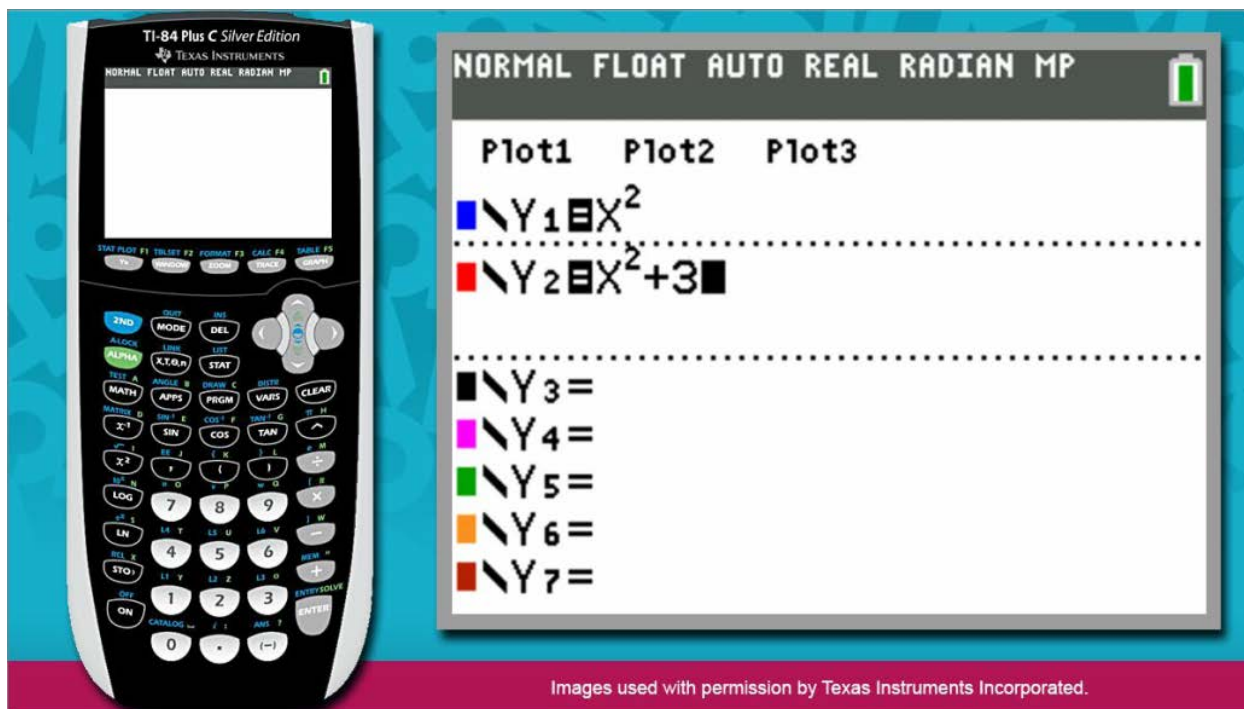


Press the Y_2 key. Then press the down arrow so that the cursor is blinking to the right of Y_2 .

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)

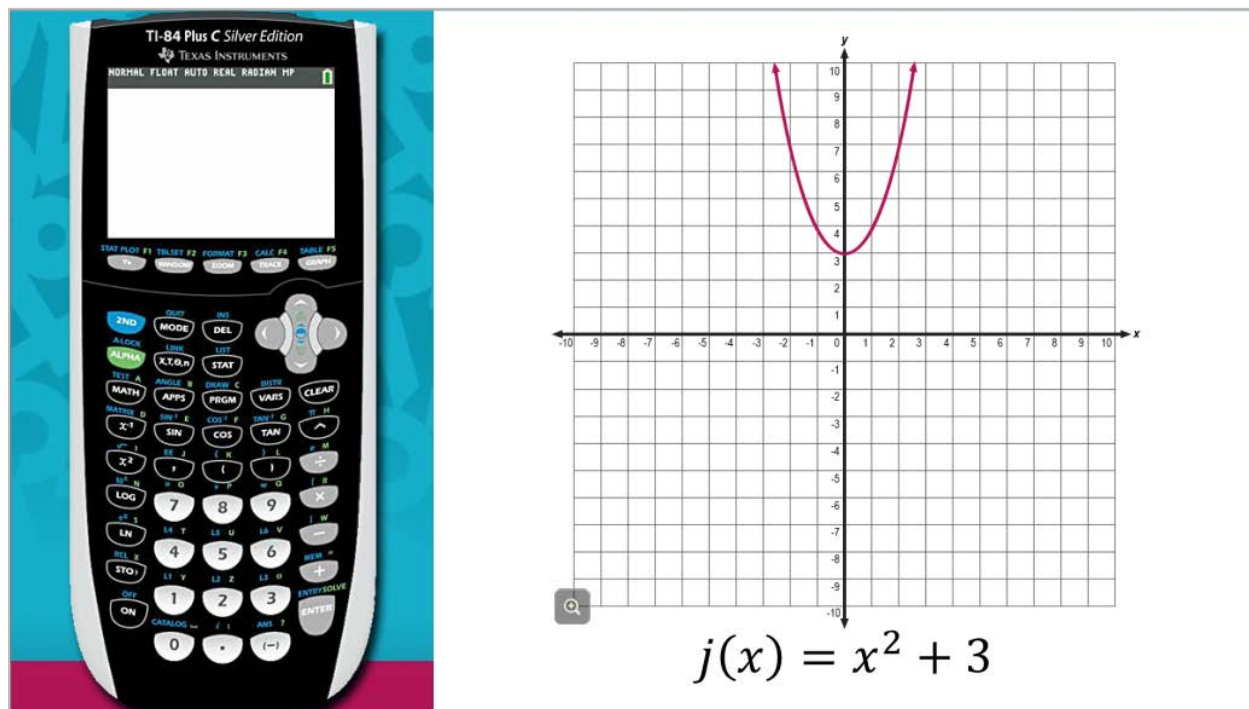


Enter the expression $x^2 + 3$ to the right of Y2.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)



Now, press GRAPH.

Notice that the graph of the function $j(x) = x^2 + 3$ is a translation of the parent function 3 units up.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)

How did translating the parent function up 3 units affect the domain?

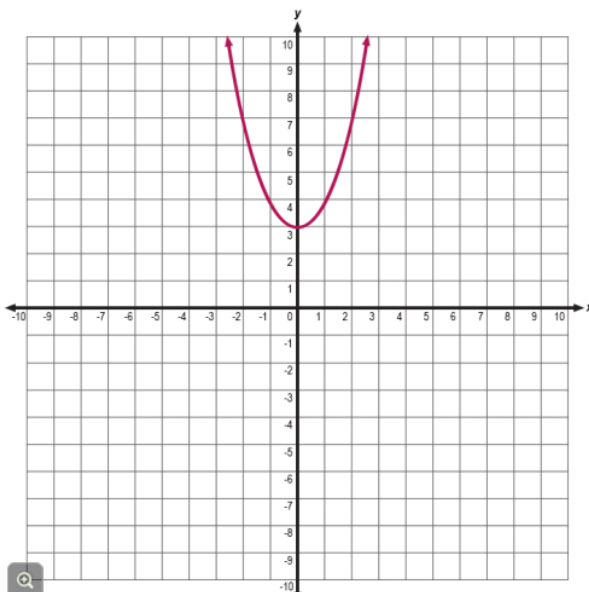
What is the domain of $j(x) = x^2 + 3$?

All real numbers

All real numbers greater than or equal to 3

$\{x: x \geq 0\}$

$\{x: x \leq 3\}$



$j(x) = x^2 + 3$

How did translating the parent function up 3 units affect the domain?

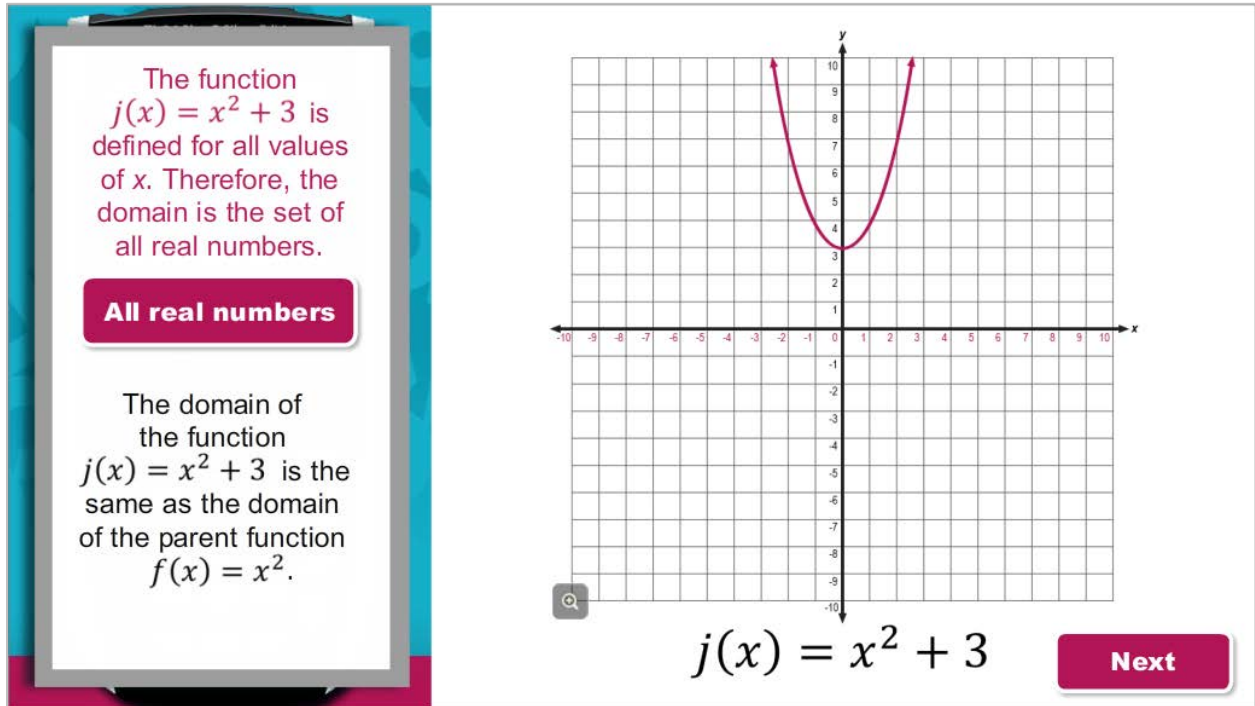
What is the domain of $j(x) = x^2 + 3$?

- A) all real numbers
- B) all real numbers greater than or equal to 3
- C) $\{x: x \geq 0\}$
- D) $\{x: x \leq 3\}$

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)



The function $j(x) = x^2 + 3$ is defined for all values of x . Therefore, the domain is the set of all real numbers.

The domain of the function $j(x) = x^2 + 3$ is the same as the domain of the function $f(x) = x^2$.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)

How did translating the parent function up 3 units affect the range?

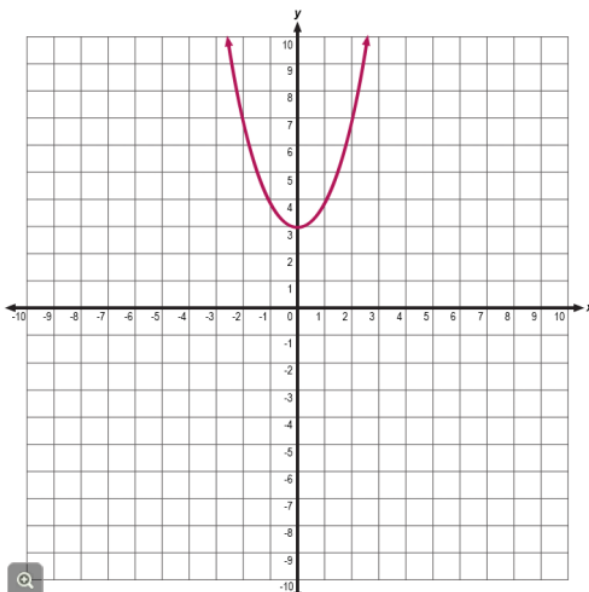
What is the range of $j(x) = x^2 + 3$?

All real numbers

All real numbers less than or equal to 3

$\{y: y \geq 0\}$

$\{y: y \geq 3\}$



$j(x) = x^2 + 3$

How did translating the parent function up 3 units affect the range?

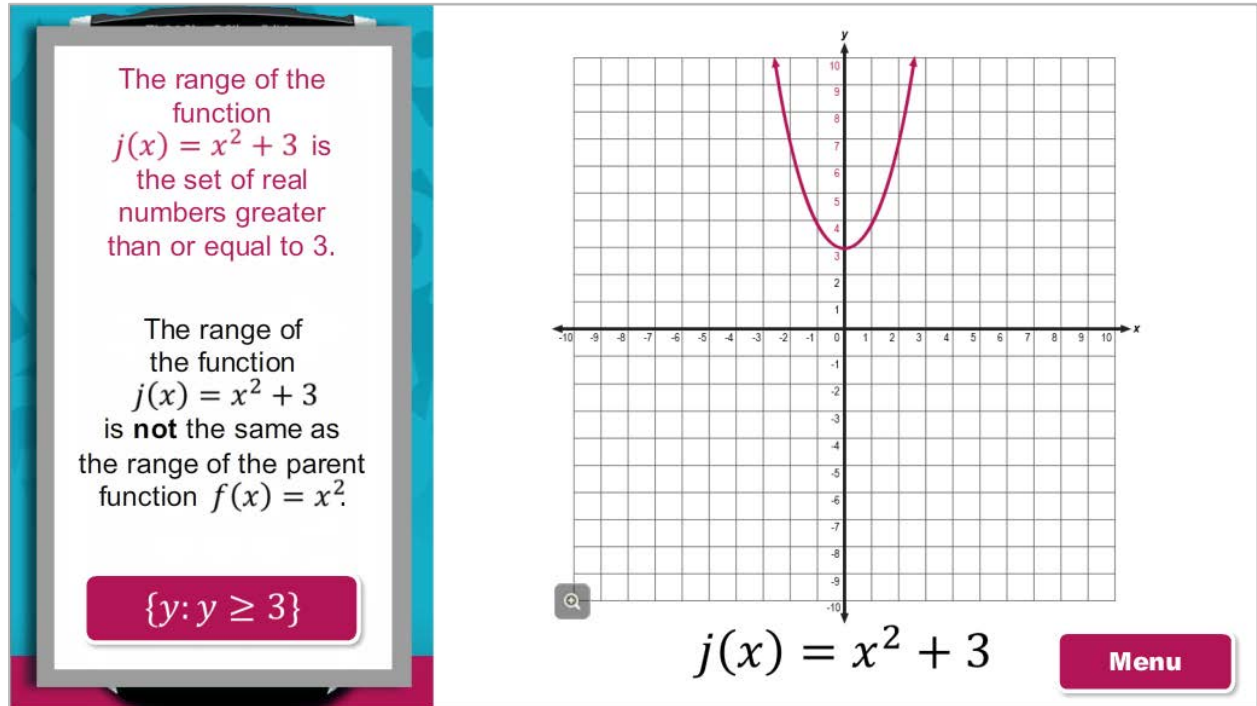
What is the range of $j(x) = x^2 + 3$?

- A) all real numbers
- B) all real numbers less than or equal to 3
- C) $\{y: y \geq 0\}$
- D) $\{y: y \geq 3\}$

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 2 (continued)



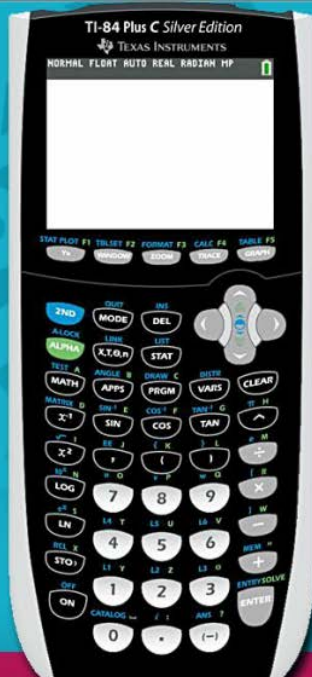
The range of the function $j(x) = x^2 + 3$ is the set of real numbers greater than or equal to 3.

The range of the function $j(x) = x^2 + 3$ is **not** the same as the range of the function $f(x) = x^2$.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 3



A TI-84 Plus C Silver Edition graphing calculator is shown on the left. The screen is blank. The calculator has a black face with silver accents and a large LCD screen at the top. The keypad includes function keys like 2ND, MODE, DEL, and various mathematical operation keys.

Example 3

Use the graphing calculator to explore how horizontal translations of the parent function affect the domain and range.

$$j(x) = (x + 3)^2$$

Images used with permission by Texas Instruments Incorporated.

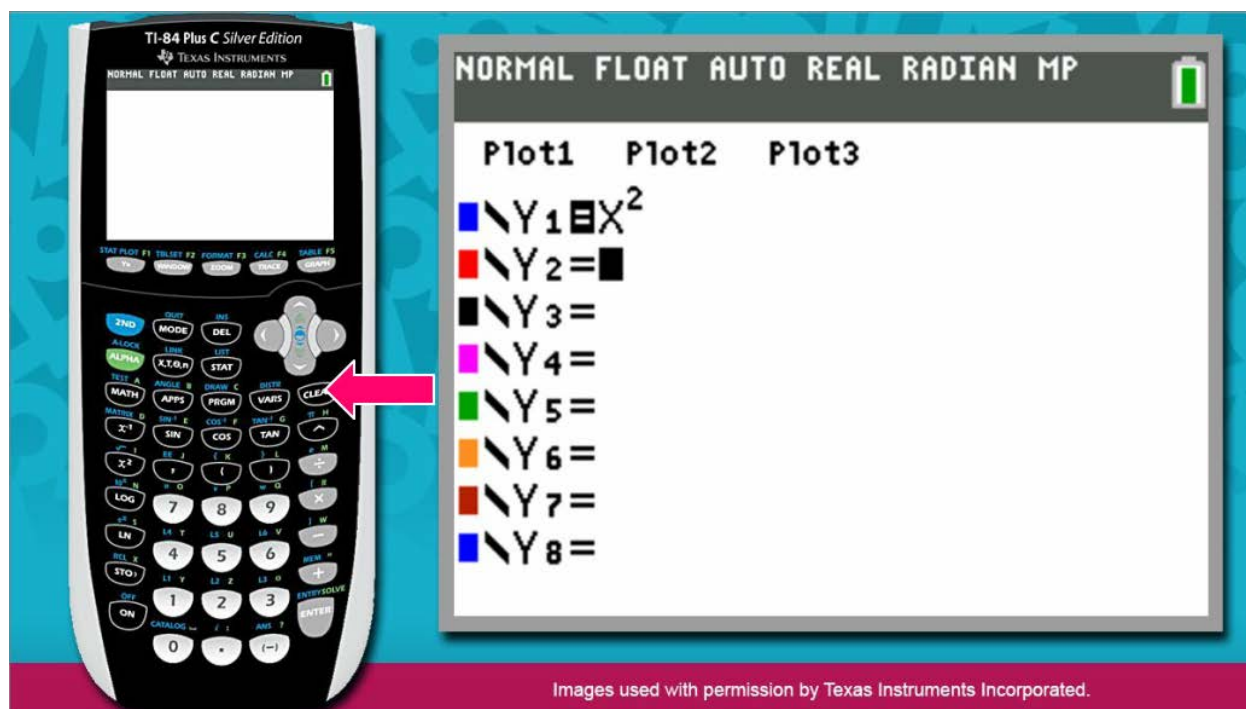
Use the graphing calculator to explore how horizontal translations of the parent function affect the domain and range.

$$j(x) = (x + 3)^2$$

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)

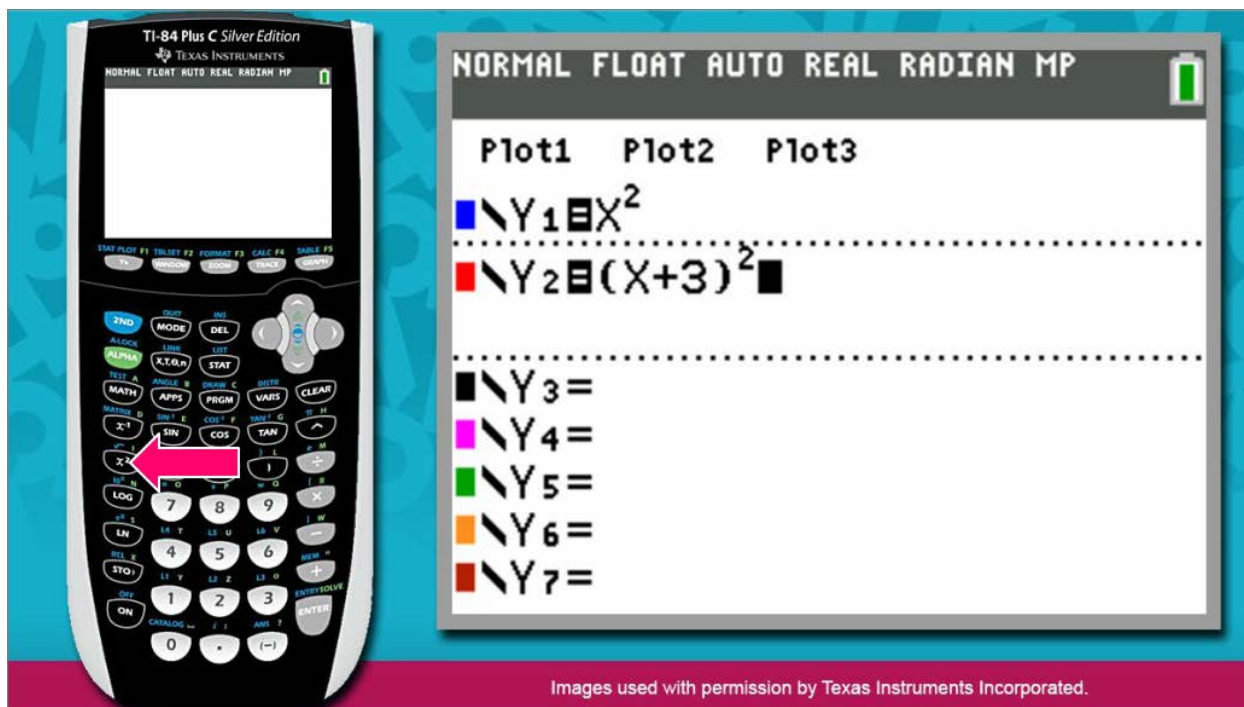


Press the Y= key. Then, press the down arrow. Next, press CLEAR to remove any expression that may be to the right of Y2.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)



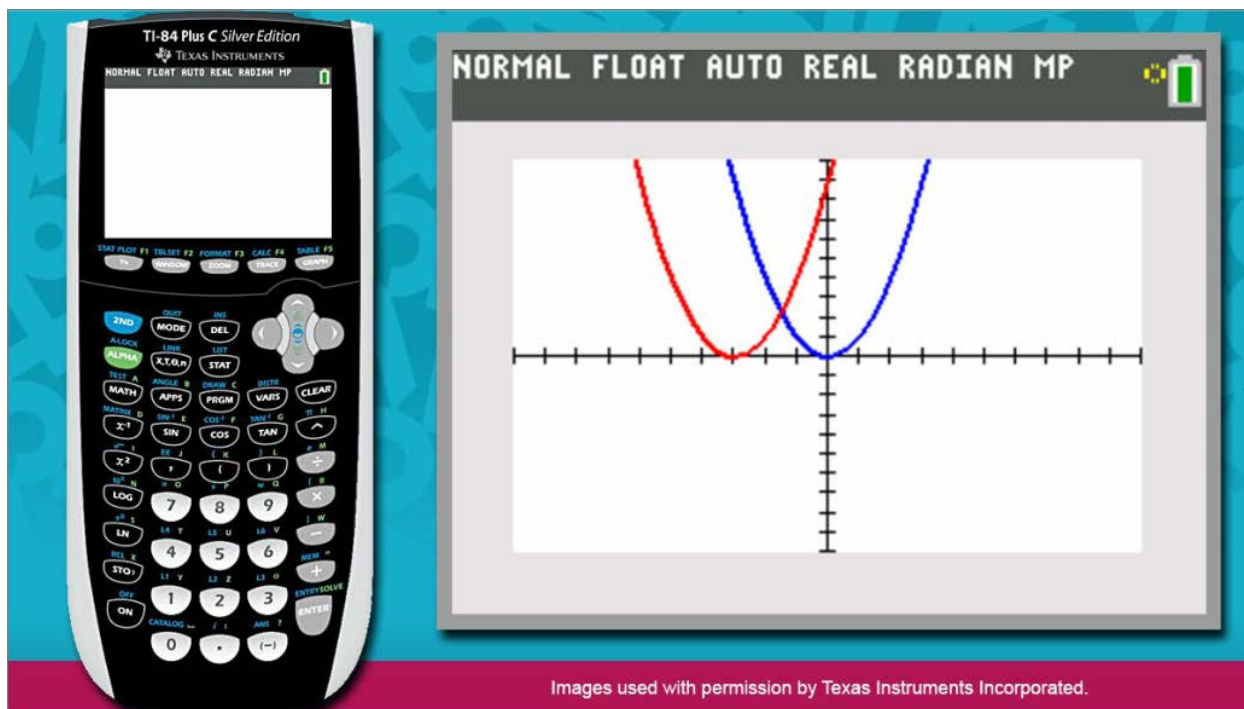
Enter $(x + 3)^2$ to the right of Y_2 .

Press the left parentheses key located above the 8 key. Then, press the x key, the addition key, and then the 3 key. Next, press the right parentheses key located above the 9 key. Then, press the x^2 key.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)



Press GRAPH.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)

Describe the transformation of the parent function $f(x) = x^2$ given by the graph of $j(x) = (x + 3)^2$.

Translated 3 units up

Translated 3 units down

Translated 3 units right

Translated 3 units left

$j(x) = (x + 3)^2$

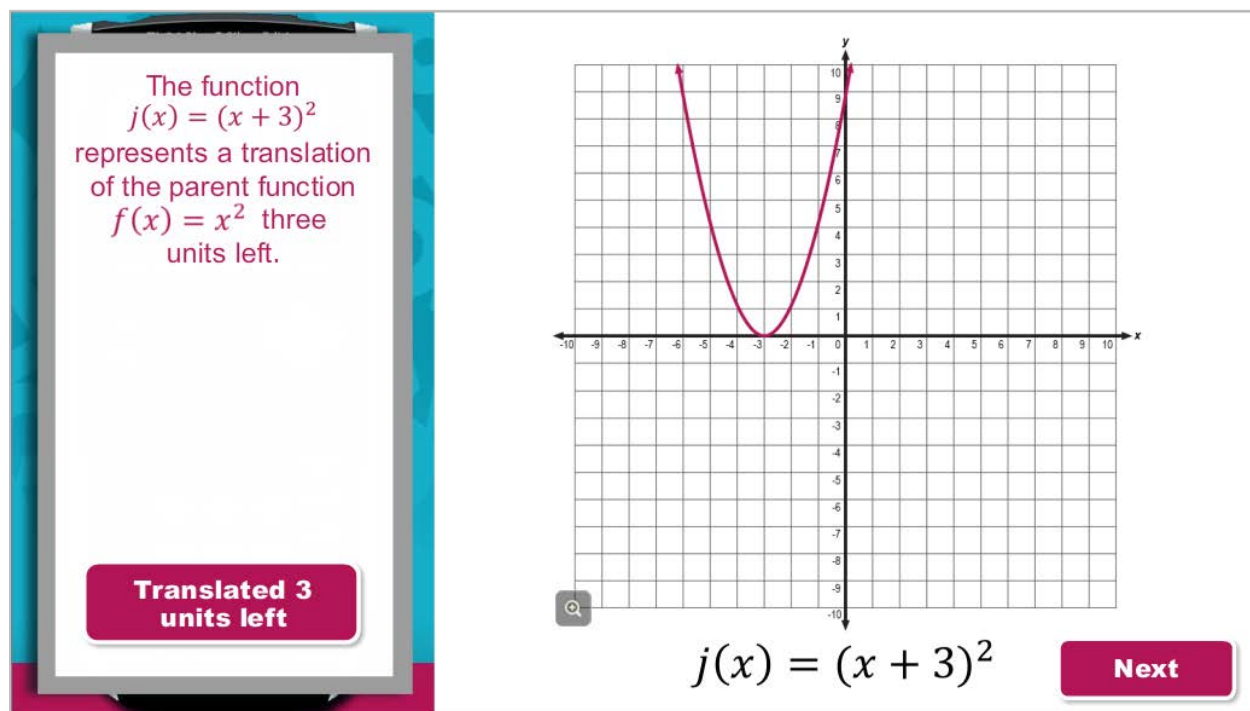
Describe the transformation of the parent function $f(x) = x^2$ given by the graph of $j(x) = (x + 3)^2$.

- A) translated 3 units up
- B) translated 3 units down
- C) translated 3 units right
- D) translated 3 units left

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)



The function $j(x) = (x + 3)^2$ represents a translation of the parent function $f(x) = x^2$ three units left.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)

How did translating the parent function left 3 units affect the domain?

What is the domain of $j(x) = (x + 3)^2$?

All real numbers

$\{x|x \geq 0\}$

$\{x|x \geq 3\}$

$\{x|x \leq 3\}$

$j(x) = (x + 3)^2$

How did translating the parent function left 3 units affect the domain?

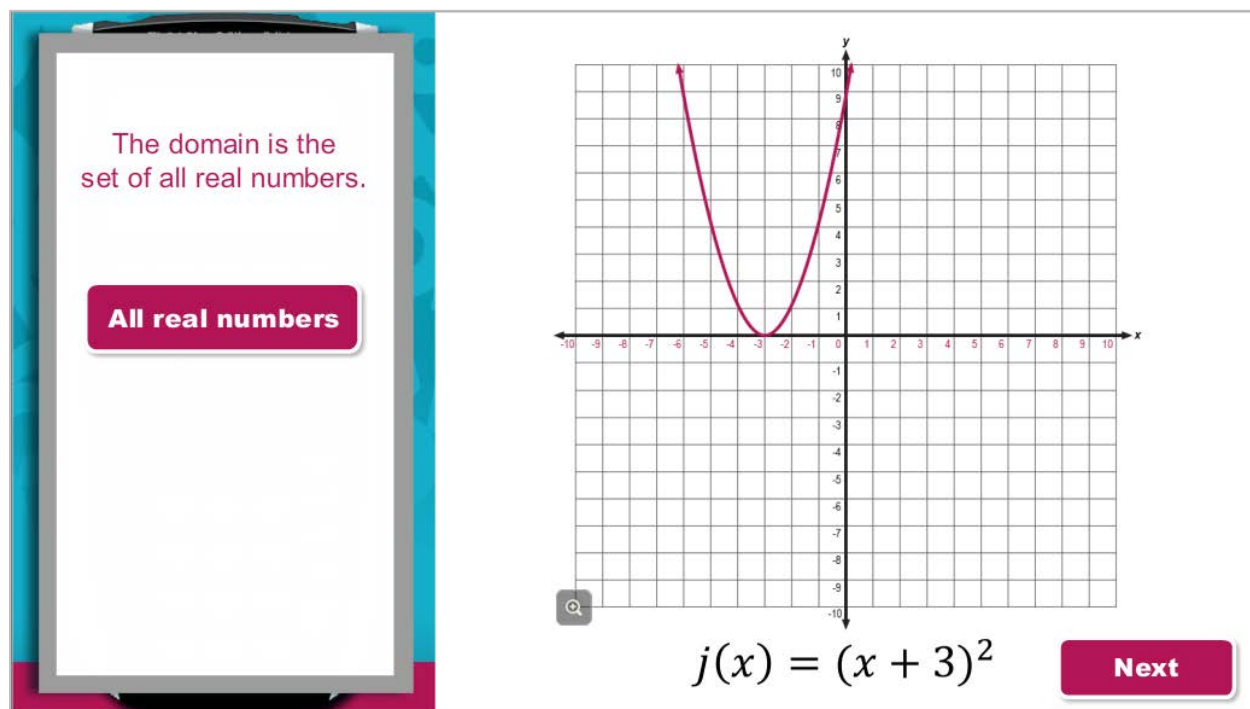
What is the domain of $(x) = (x + 3)^2$?

- A) all real numbers
- B) $\{x|x \geq 0\}$
- C) $\{x|x \geq 3\}$
- D) $\{x|x \leq 3\}$

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)



The domain is the set of all real numbers.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Example 3 (continued)

How did translating the parent function left 3 units affect the range?

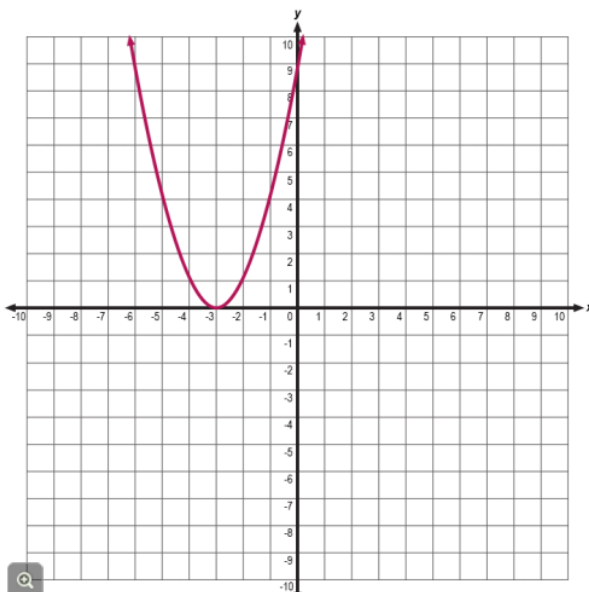
What is the range of $j(x) = (x + 3)^2$?

All real numbers

$\{y|y \geq 0\}$

$\{y|y \leq 0\}$

$\{y|y \geq 3\}$



$j(x) = (x + 3)^2$

How did translating the parent function left 3 units affect the range?

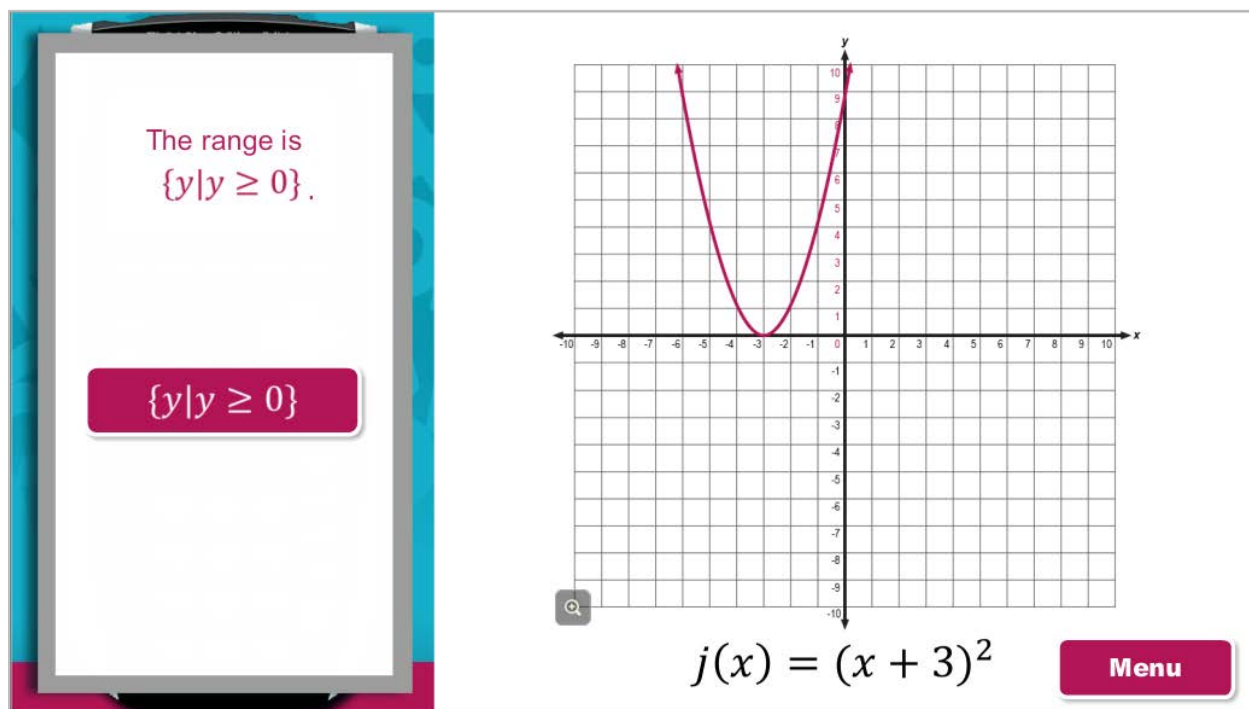
What is the range of $(x) = (x + 3)^2$?

- A) all real numbers
- B) $\{y|y \geq 0\}$
- C) $\{y|y \leq 0\}$
- D) $\{y|y \geq 3\}$

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes


Example 3 (continued)



The range is the set of all real numbers greater than or equal to 0.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 1

 **Self-Check**

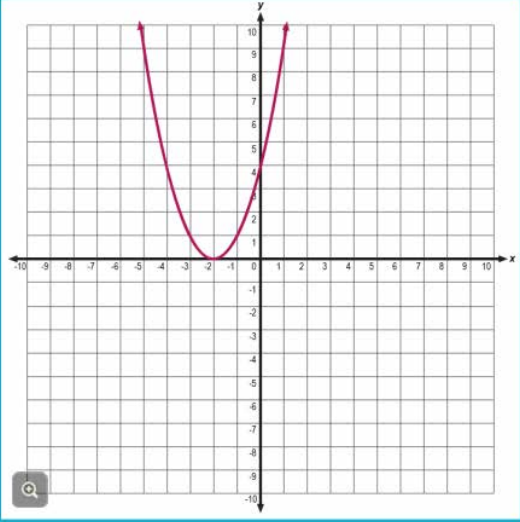
Choose the graph that represents the transformation of the quadratic parent function given by the equation

$$j(x) = x^2 - 2$$

- Graph A
- Graph B
- Graph C
- Graph D

SUBMIT

Graph A



[CLICK HERE](#) to view additional options.

Solve the problem in the image above to check your understanding of the content.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

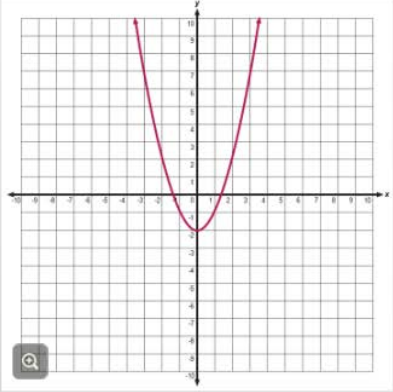
Self-Check 1: Answer

Self Check **Graph A**

Correct

That's correct! The correct answer is Graph B.

The function $j(x) = x^2 - 2$ represents a translation of the parent function $f(x) = x^2$ two units down.




[Continue](#)

SUBMIT [CLICK HERE to view additional options.](#)

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 2

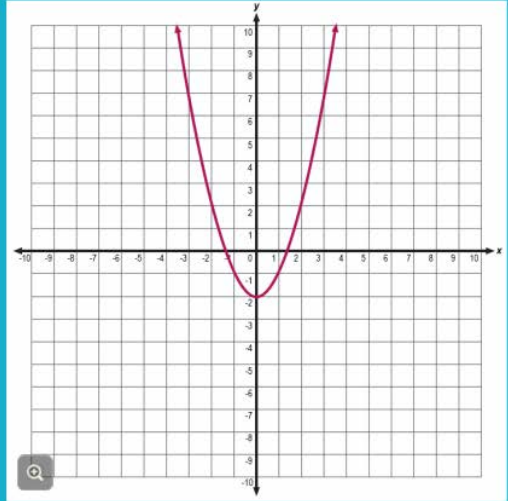
 **Self-Check**

Given the function: $j(x) = x^2 - 2$
Complete the statements below.

The is the set of all real numbers greater than or equal to -2 .

The is the set of all real numbers.

SUBMIT



Solve the problem in the image above to check your understanding of the content.

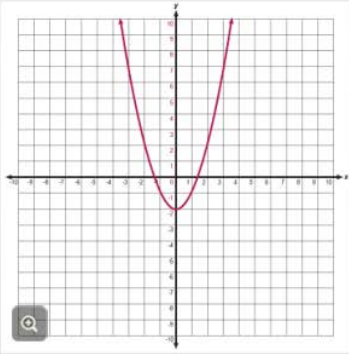
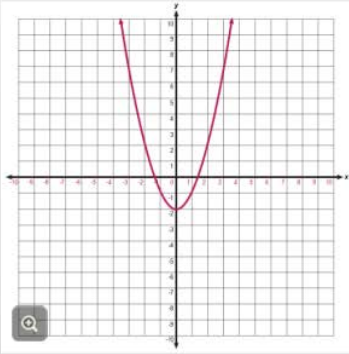
Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 2: Answer

Correct

That's correct!

The domain is the set of all real numbers.



The range is the set of all real numbers greater than or equal to -2 .

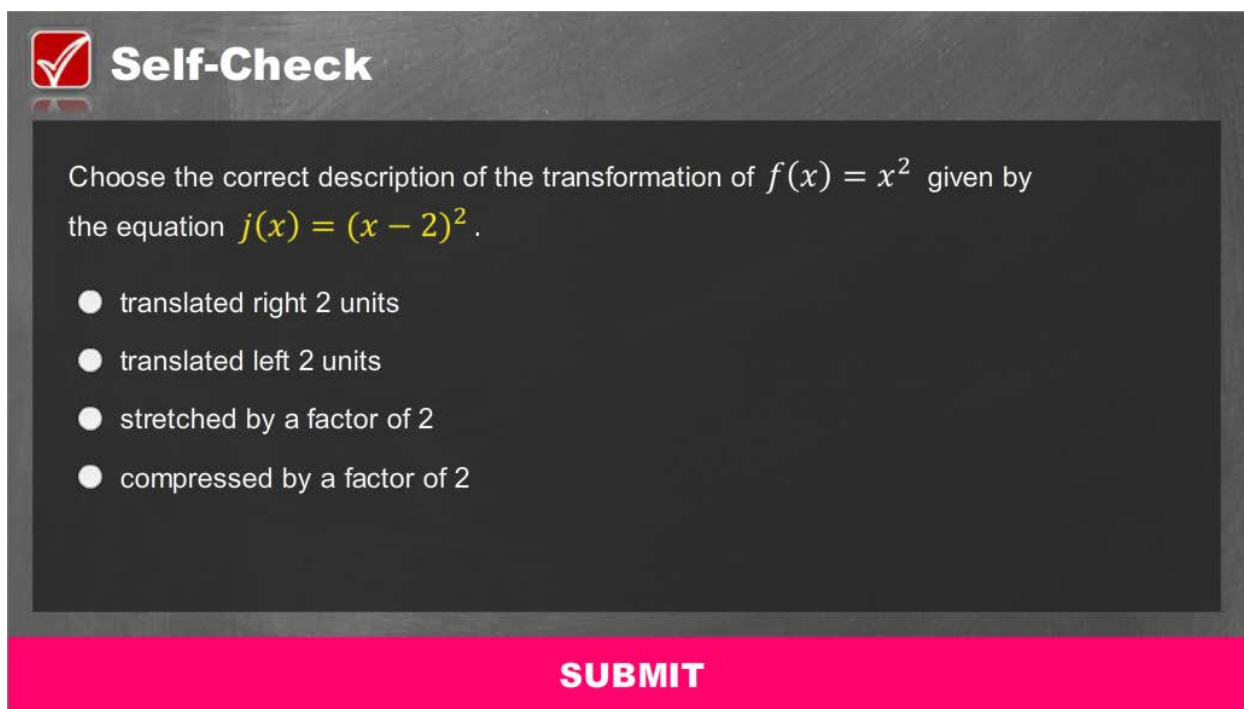
Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 3

A digital interface for a self-check exercise. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a black box contains the question text and four radio button options. At the bottom, a bright pink bar contains the word "SUBMIT" in white capital letters.

Self-Check

Choose the correct description of the transformation of $f(x) = x^2$ given by the equation $j(x) = (x - 2)^2$.

- translated right 2 units
- translated left 2 units
- stretched by a factor of 2
- compressed by a factor of 2

SUBMIT

Solve the problem in the image above to check your understanding of the content.

Module 10: Linear and Quadratic Function Families

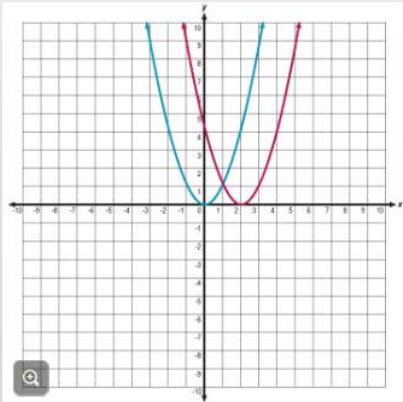
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 3: Answer

Correct

That's correct!

The function $j(x) = (x - 2)^2$ represents a translation of the parent function $f(x) = x^2$ two units right.




Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 4

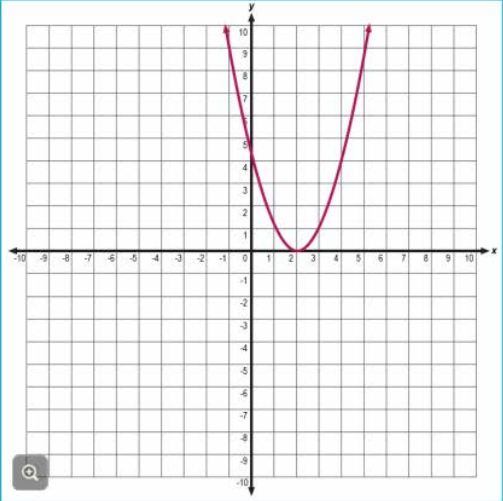
 **Self-Check**

Given the function: $j(x) = (x - 2)^2$
Complete the statements below.

The is the set of all real numbers.

The is the set of all real numbers greater than or equal to 0.

SUBMIT



Solve the problem in the image above to check your understanding of the content.

Module 10: Linear and Quadratic Function Families

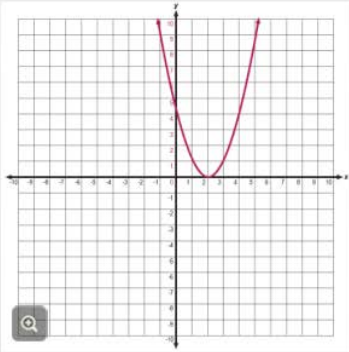
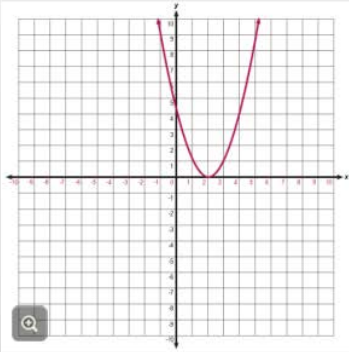
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 4: Answer

Correct

That's correct!

The domain is the set of all real numbers.



The range is the set of all real numbers greater than or equal to 0.

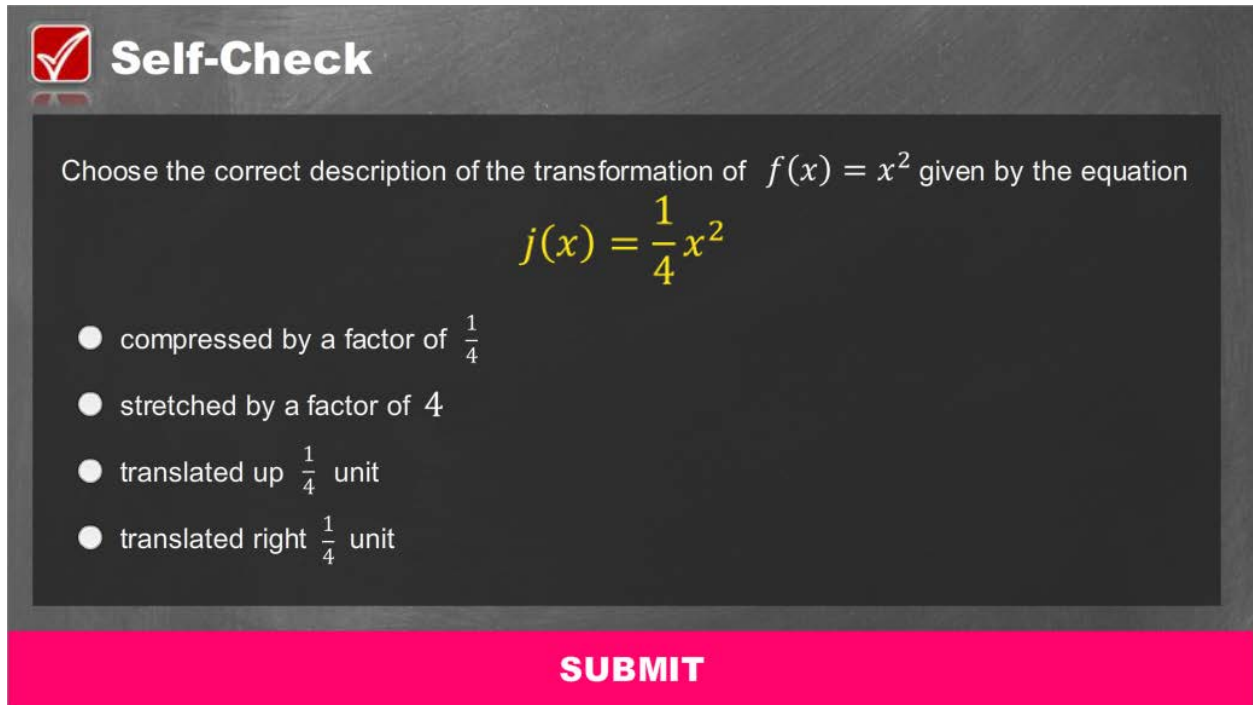
Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 5

A digital interface for a self-check question. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a question asks for the correct description of the transformation of $f(x) = x^2$ given by the equation $j(x) = \frac{1}{4}x^2$. The equation is displayed in yellow. There are four radio button options: "compressed by a factor of $\frac{1}{4}$ ", "stretched by a factor of 4", "translated up $\frac{1}{4}$ unit", and "translated right $\frac{1}{4}$ unit". At the bottom of the interface is a bright pink button labeled "SUBMIT" in white capital letters.

Self-Check

Choose the correct description of the transformation of $f(x) = x^2$ given by the equation

$$j(x) = \frac{1}{4}x^2$$

- compressed by a factor of $\frac{1}{4}$
- stretched by a factor of 4
- translated up $\frac{1}{4}$ unit
- translated right $\frac{1}{4}$ unit

SUBMIT

Solve the problem in the image above to check your understanding of the content.

Module 10: Linear and Quadratic Function Families

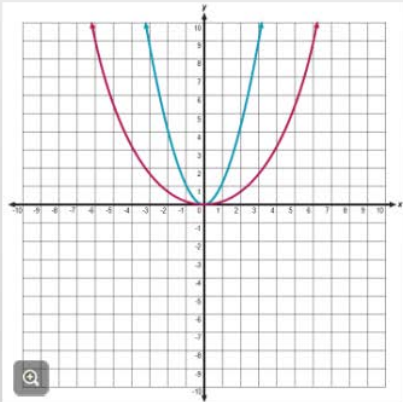
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 5: Answer

Correct

That's correct!

The function $j(x) = \frac{1}{4}x^2$ represents a compression of the parent function $f(x) = x^2$ by a factor of $\frac{1}{4}$.




Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

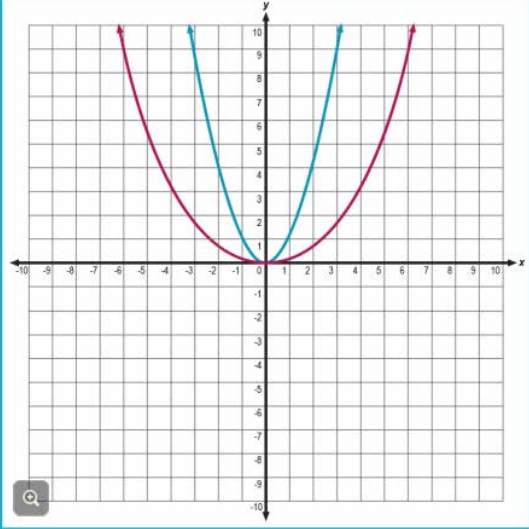
Self-Check 6

 **Self-Check**

The function $j(x) = \frac{1}{4}x^2$ has the same domain as the parent function $f(x) = x^2$.

- True
- False

SUBMIT



Solve the problem in the image above to check your understanding of the content.

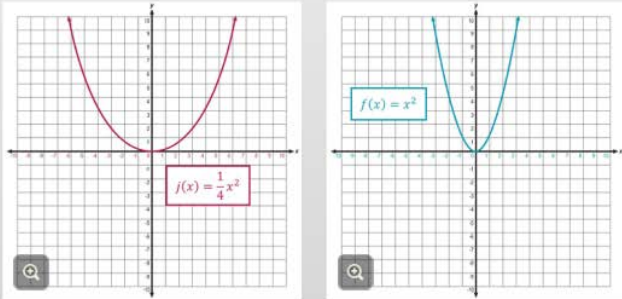
Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 6: Answer

Correct

That's correct! The domain of the functions $j(x) = \frac{1}{4}x^2$ and $f(x) = x^2$ is the set of all real numbers.



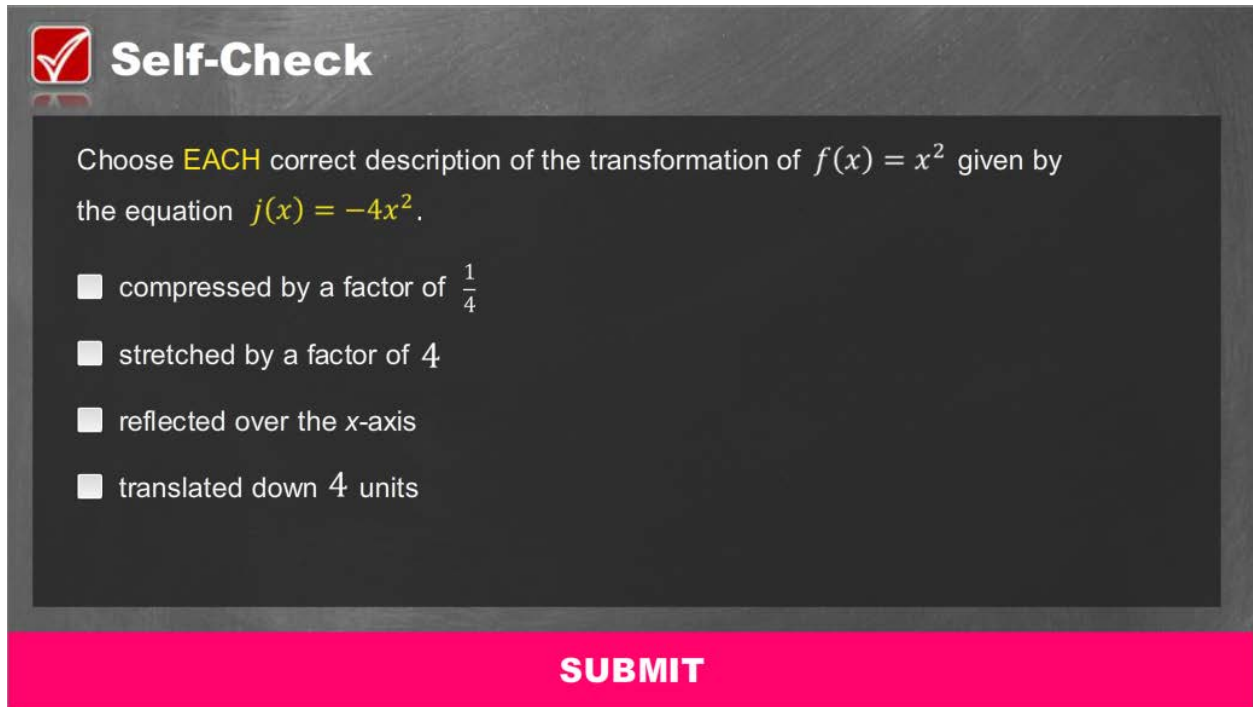
Continue

SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families
Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 7

A digital interface for a self-check exercise. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a black box contains the question text and four multiple-choice options, each with a white square checkbox. At the bottom of the interface is a bright pink bar with the word "SUBMIT" in white capital letters.

Self-Check

Choose **EACH** correct description of the transformation of $f(x) = x^2$ given by the equation $j(x) = -4x^2$.

- compressed by a factor of $\frac{1}{4}$
- stretched by a factor of 4
- reflected over the x-axis
- translated down 4 units

SUBMIT

Solve the problem in the image above to check your understanding of the content.

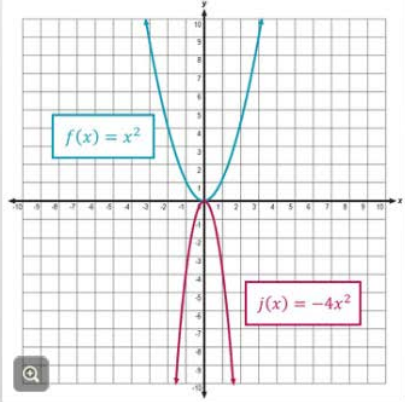
Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

Self-Check 7: Answer

Correct

That's correct! The graph of the parent function was stretched by a factor of 4 and reflected over of the x-axis.



Continue


SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

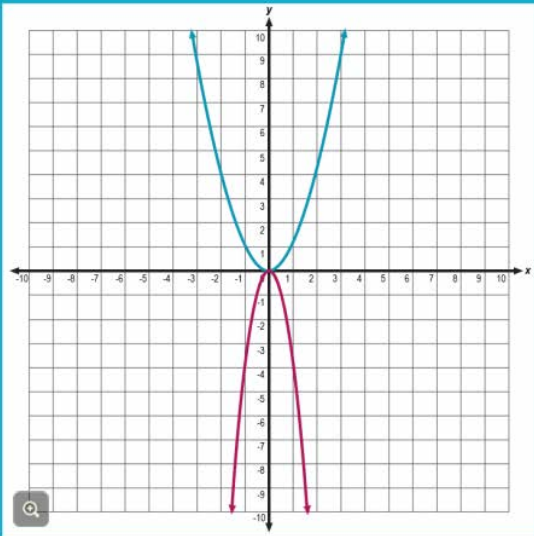
Self-Check 8

 **Self-Check**

Choose **EACH** correct description of the transformation of $f(x) = x^2$ given by the equation $j(x) = -4x^2$.

- The functions have the same domain.
- The functions have different domains.
- The range of each function is the same.
- The range of each function is different.

SUBMIT



Solve the problem in the image above to check your understanding of the content.

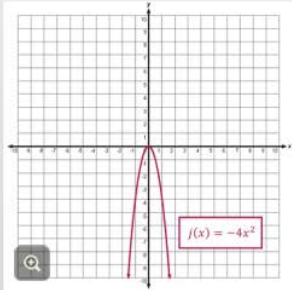
Module 10: Linear and Quadratic Function Families

Topic 1 Content: Exploring Quadratic Functions Notes

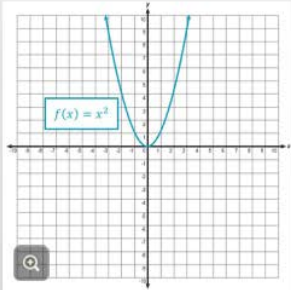
Self-Check 8: Answer

Correct

That's correct! The functions have the same domain, but the range of each function is different.



Domain: the set of all real numbers
Range: $\{y|y \leq 0\}$



Domain: the set of all real numbers
Range: $\{y|y \geq 0\}$

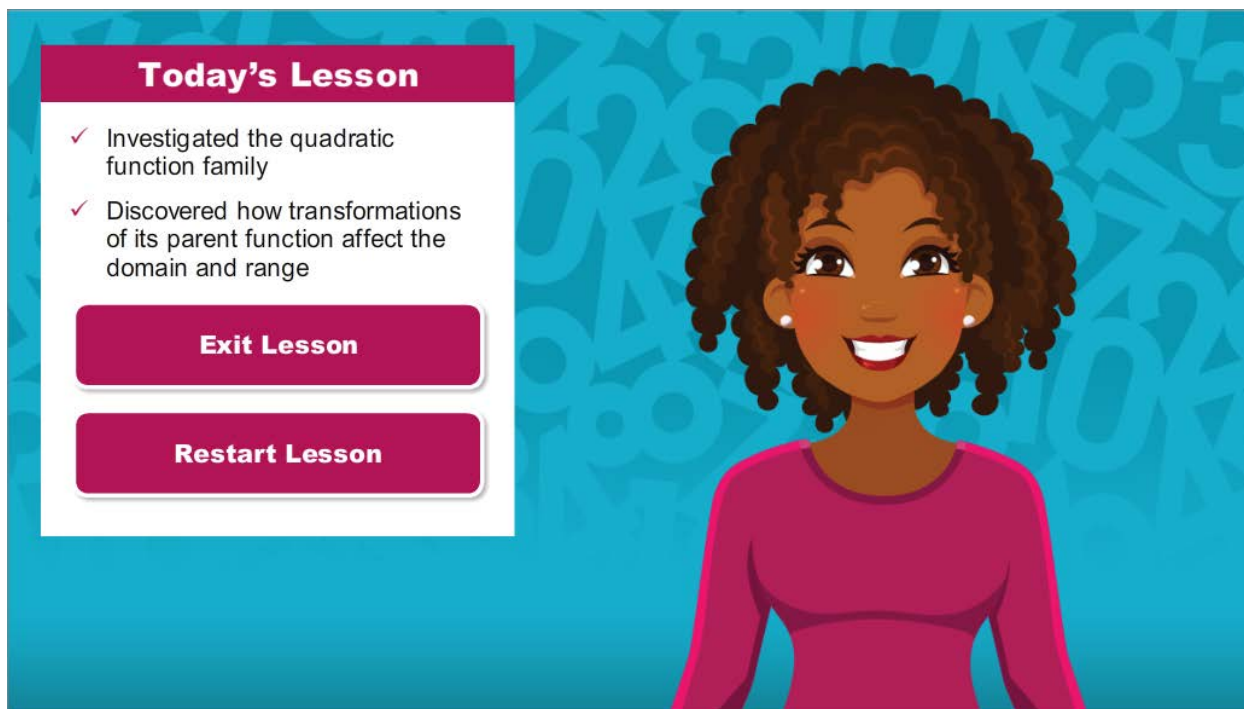
SUBMIT

For your reference, the image above shows the correct solution to the self-check problem.

Module 10: Linear and Quadratic Function Families

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Conclusion



The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header titled "Today's Lesson" contains a checklist of two items, both marked with a checkmark. Below the list are two pink buttons: "Exit Lesson" and "Restart Lesson". To the right of this box is a cartoon illustration of a young woman with dark skin, curly hair, and a pink top, smiling. The background is a blue pattern of mathematical symbols.

Today's Lesson

- ✓ Investigated the quadratic function family
- ✓ Discovered how transformations of its parent function affect the domain and range

Exit Lesson

Restart Lesson

You have reached the conclusion of this lesson where explored the quadratic function family and discovered how transformations of its parent function affect the domain and range.