

## 1.2 Functions and Their Properties

### Domain, Range, & Continuity of Functions

Target 1A: Analyze functions using specific properties

#### Review of Prior Concepts

Is the formula a function? (Graph them to complete the vertical line test).

*Vertical Line Test:* A graph in the coordinate plane defines  $y$  as a function of  $x \Leftrightarrow$  no vertical line intersects the graph in more than one pt.



1.  $y = x^2$

2.  $y^2 = x$

3.  $y = \sqrt{x}$

4.  $x^2 + y^2 = 4$

A *function* from a set  $D$  to a set  $R$  ( $f: D \rightarrow R$ ) is a rule that assigns to every element in  $D$  a unique element in  $R$ ; i.e., The set  $D$  of all input values is the *Domain* of the function, and the set  $R$  of all output values is the *Range* of the function.

#### More Practice

##### Is it a Function?

<http://www.mathwarehouse.com/algebra/relation/vertical-line-test.php>

<https://www.youtube.com/watch?v=zT69oxcMhPw>

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/cc-8th-function-intro/e/recog-func-2>

#### SAT Connection

##### Passport to Advanced Math

13. Use function notation, and interpret statements using function notation.

Example:

$$g(x) = ax^2 + 24$$

For the function  $g$  defined above,  $a$  is a constant and  $g(4) = 8$ . What is the value of  $g(-4)$  ?

A) 8

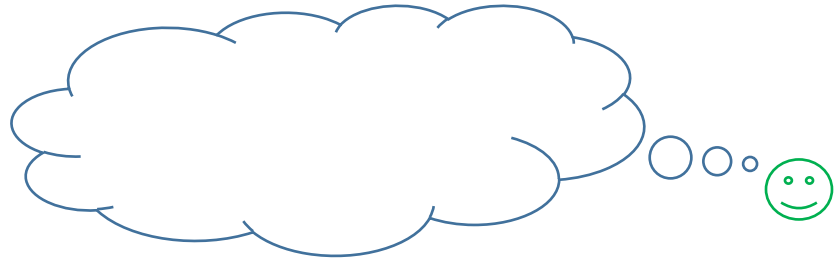
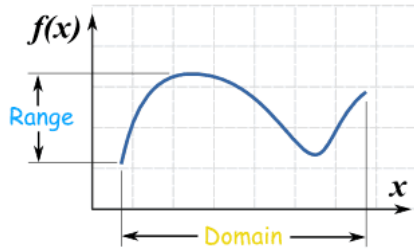
B) 0

C) -1

D) -8

[Solution](#)

## Domain &amp; Range



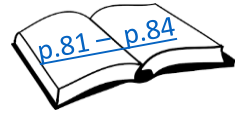
Find the domain algebraically & the range graphically of each function.

Example 1:

$$f(x) = \frac{2}{x^2 - 3x - 4}$$

Domain

Range



Example 2:

$$g(x) = \frac{\sqrt{x-3}}{x^2 - 3x - 4}$$

Domain

Range

Example 3:

$$h(x) = \frac{x^2}{x^2 - 3x}$$

Domain

Range

### More Practice

#### Domain & Range

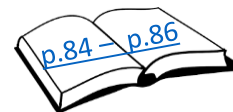
<http://www.coolmath.com/algebra/15-functions/06-finding-the-domain-01>

<https://www.khanacademy.org/math/algebra/algebra-functions/domain-and-range/v/domain-of-a-function-intro>

<http://www.intmath.com/functions-and-graphs/2a-domain-and-range.php>

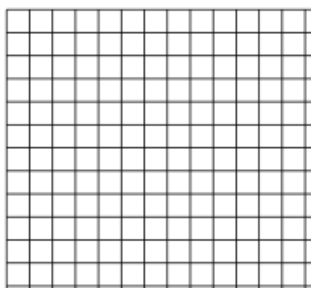
## Continuity &amp; Discontinuity

- Functions are continuous if \_\_\_\_\_
- Removable discontinuity
- Non-removable discontinuity
  - 
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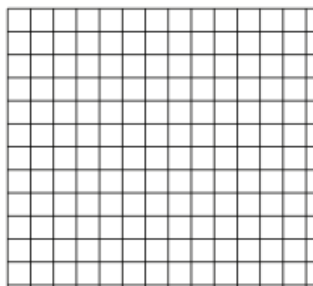


Graph the function. Identify any points of discontinuity and describe the type of discontinuity.

Example 4:  $f(x) = \frac{x^2}{x^2-3x}$



Example 5:  $g(x) = \frac{x^2-9}{x+3}$



## More Practice

## Continuity

<http://www.ck12.org/Analysis/Discrete-and-Continuous-Functions/lesson/Continuity-and-Discontinuity-PCALC/>

<https://www.youtube.com/watch?v=2n5VzMFJQVY>

## Homework Assignment

p.94 #1,3,13,14,15,18,19

**SAT Connection****Solution**

**Choice A is correct.** Since  $g$  is an even function,  $g(-4) = g(4) = 8$ .

Alternatively: First find the value of  $a$ , and then find  $g(-4)$ . Since  $g(4) = 8$ , substituting 4 for  $x$  and 8 for  $g(x)$  gives  $8 = a(4)^2 + 24 = 16a + 24$ . Solving this last equation gives  $a = -1$ . Thus  $g(x) = -x^2 + 24$ , from which it follows that  $g(-4) = -(-4)^2 + 24$ ;  $g(-4) = -16 + 24$ ; and  $g(-4) = 8$ .

Choices B, C, and D are incorrect because  $g$  is a function and there can only be one value of  $g(-4)$ .