

# Precalculus · Functions: Domain, Range, Composition and Inverses · Worksheet

Common Core F-IF.A.1, F-BF.A.1c, F-BF.B.4b, F-BF.B.4c, F-BF.B.4d · mathovore.fr

Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Score: \_\_\_\_\_

This precalculus functions review worksheet gives 24 problems on functions: domain, range, composition and inverses, ordered from easy to hard, with a separate answer key.

These 24 problems practice function notation, domain in interval notation, composition and decomposition, and inverse functions (F-IF.A.1, F-BF.A.1c, F-BF.B.4b, F-BF.B.4c, F-BF.B.4d). They move from evaluating and finding domains to inverses read from graphs and tables.

The last six problems use real contexts and multi-step reasoning, including restricted domains and the inverse of a composition. Show every step.

**Precalculus Common Core: F-IF.A.1 · F-BF.A.1c · F-BF.B.4b · F-BF.B.4c · F-BF.B.4d**

## Precalculus Functions Review Worksheet: problems 1-5

### Problem 1: Evaluate function notation

Let  $f(x) = 3x^2 - 2x + 1$ . Evaluate each expression.

- a.  $f(3)$
- b.  $f(-2)$
- c.  $f(a+1)$

### Problem 2: Domain with square roots

Write the domain of each function in interval notation.

- a.  $f(x) = \sqrt{2x-6}$
- b.  $g(x) = \sqrt{10-5x}$

### Problem 3: Domain with denominators

Write the domain of each function in interval notation.

- a.  $f(x) = \frac{x+1}{x^2-9}$
- b.  $g(x) = \frac{1}{x^2+4}$

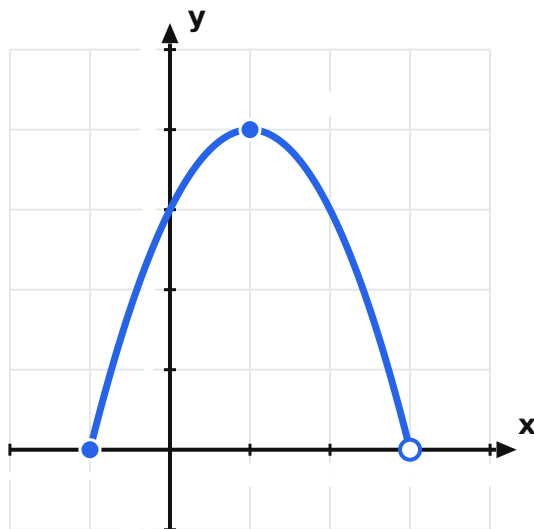
### Problem 4: Domain with several restrictions

Write the domain of each function in interval notation.

- a.  $f(x) = \frac{\sqrt{x+4}}{x-2}$
- b.  $g(x) = \ln(5-x)$

### Problem 5: Domain and range from a graph

The graph shows a function  $f$  with a closed point at  $(-1,0)$  and an open point at  $(3,0)$ .



Graph of  $f$  for exercise 5.

- a. State the domain in interval notation.
- b. State the range in interval notation.
- c. Find every  $x$  with  $f(x) = 3$ .

## Precalculus Functions Review Worksheet: problems 6-10

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### Problem 6: Composition from tables

Use the tables to evaluate each expression.

| $x$    | 1 | 2 | 3 | 4 |
|--------|---|---|---|---|
| $f(x)$ | 2 | 4 | 1 | 3 |
| $g(x)$ | 3 | 1 | 4 | 2 |

- a.  $f(g(1))$
- b.  $g(f(3))$
- c.  $f(f(1))$

d.  $g(g(4))$

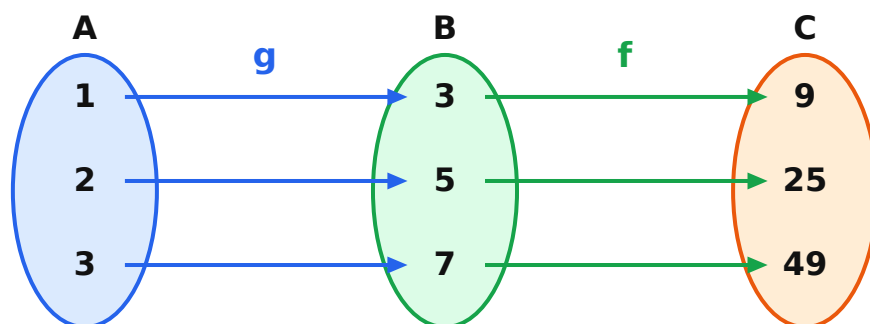
### Problem 7: Composition of polynomials

Let  $f(x) = x^2 + 1$  and  $g(x) = 3x - 2$ .

- Write and simplify  $f(g(x))$ .
- Write and simplify  $g(f(x))$ .
- Evaluate  $f(g(2))$ .

### Problem 8: Composition from a mapping diagram

Function  $g$  maps set A to set B and  $f$  maps set B to set C, as shown.



Mapping diagram for  $g$  (set A to set B) followed by  $f$  (set B to set C).

- Find  $f(g(1))$ ,  $f(g(2))$  and  $f(g(3))$ .
- Write rules for  $g(x)$  and  $f(x)$ , then a formula for  $f(g(x))$ .

### Problem 9: Domain of a composition (roots)

Let  $f(x) = \sqrt{x}$  and  $g(x) = x - 5$ . Write each composition and state its domain.

- $f(g(x))$
- $g(f(x))$

### Problem 10: Domain of a composition (rational)

Let  $f(x) = \frac{1}{x}$  and  $g(x) = x + 2$ . Write each composition and state its domain.

- $f(g(x))$
- $g(f(x))$

## Precalculus Functions Review Worksheet: problems 11-15

### Problem 11: Decompose a function

For each  $h(x)$ , write  $f(x)$  and  $g(x)$  (neither equal to  $x$ ) so that  $h(x) = f(g(x))$ .

- a.  $h(x) = (2x+5)^4$
- b.  $h(x) = \frac{1}{(x-3)^2}$
- c.  $h(x) = \sqrt{x^2+9}$

### Problem 12: Inverse of a linear function

Find the inverse function of each.

- a.  $f(x) = 5x - 3$
- b.  $g(x) = -\frac{2}{3}x + 4$

### Problem 13: Inverse of a rational function

Let  $f(x) = \frac{2x+1}{x-3}$ . Find  $f^{-1}(x)$ , then state the domain and range of  $f$ .

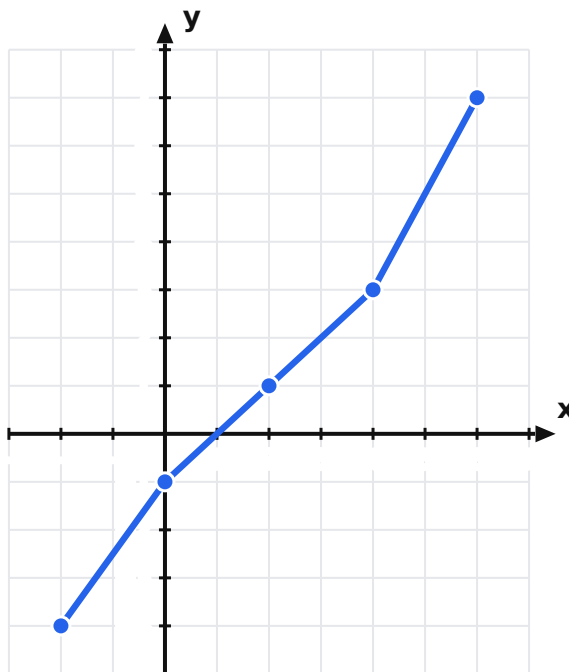
### Problem 14: Verify inverse functions

Decide whether  $f$  and  $g$  are inverse functions by computing both compositions.

- a.  $f(x) = x^3 + 4$  and  $g(x) = \sqrt[3]{x-4}$
- b.  $f(x) = \frac{1}{2}x - 3$  and  $g(x) = 2x + 3$

### Problem 15: Inverse values from a graph

The graph shows a one-to-one function  $f$  through the points  $(-2, -4)$ ,  $(0, -1)$ ,  $(2, 1)$ ,  $(4, 3)$  and  $(6, 7)$ .



Graph of  $f$  for exercise 15.

- Evaluate  $f(2)$ .
- Evaluate  $f^{-1}(3)$ .
- Evaluate  $f^{-1}(-1)$ .
- Evaluate  $f^{-1}(7)$ .

## Precalculus Functions Review Worksheet: problems 16-20

### Problem 16: Inverse values from tables

Table 1 shows a function  $f$ . Table 2 shows a function  $g$ .

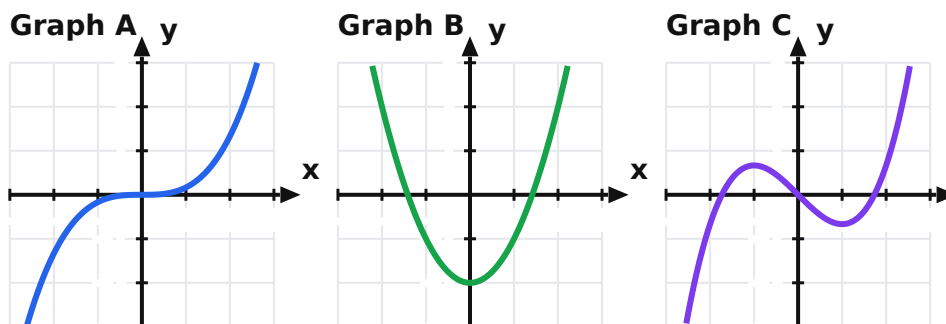
| x    | 0 | 1 | 2 | 3  | 4  |
|------|---|---|---|----|----|
| f(x) | 5 | 3 | 0 | -2 | -6 |

| x    | 1 | 2 | 3 |
|------|---|---|---|
| g(x) | 4 | 7 | 4 |

- Find  $f^{-1}(0)$  and  $f^{-1}(-2)$ .
- Evaluate  $f^{-1}(f(1))$ .
- Explain why  $g$  has no inverse function.

### Problem 17: Horizontal line test

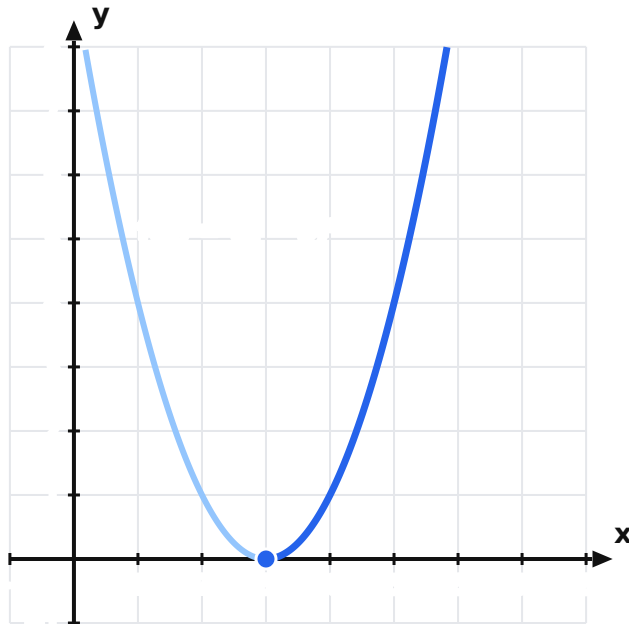
Use the horizontal line test on each graph. State which graphs are functions that have an inverse function.



Three graphs for the horizontal line test.

### Problem 18: Restrict a domain: vertex form

The graph shows  $f(x) = (x-3)^2$ .



Graph of  $f(x) = (x - 3)^2$ .

- Explain why  $f$  has no inverse function on all real numbers.
- Restrict the domain to  $x \geq 3$ . Find  $f^{-1}(x)$ , with its domain and range.
- Evaluate  $f^{-1}(16)$ .

### Problem 19: Restrict a domain: complete the square

Let  $f(x) = x^2 + 4x$  with the domain restricted to  $x \geq -2$ . Find  $f^{-1}(x)$  and state its domain and range.

### Problem 20: Temperature conversion

The function  $C(F) = \frac{5}{9}(F - 32)$  converts degrees Fahrenheit to degrees Celsius.

- Find the inverse function  $F(C)$ .
- Normal body temperature is  $37^\circ\text{C}$ . Convert it to Fahrenheit.
- Show that  $C(F(C)) = C$ .

## Precalculus Functions Review Worksheet: problems 21-24

### Problem 21: Coupon and discount order

Maya buys a jacket that costs  $p$  dollars. The store takes 20% off,  $d(p) = 0.8p$ , and she also has a \$5 coupon,  $c(p) = p - 5$ . The jacket costs \$60.

- Find  $c(d(60))$  and  $d(c(60))$ .
- Write formulas for  $c(d(p))$  and  $d(c(p))$ .

- c. Explain which order saves more and by how much.

### Problem 22: Taxi fare inverse

A taxi charges  $F(m) = 2.50 + 1.80m$  dollars for a ride of  $m$  miles.

- Find the inverse function  $m(F)$  and explain what it computes.
- Jamal pays \$20.50. How many miles did he ride?
- Aisha pays \$11.50. How many miles did she ride?

### Problem 23: Growing ripple

A circular ripple has radius  $r(t) = 3t$  feet after  $t$  seconds. Its area is  $A(r) = \pi r^2$  square feet.

- Write  $A(r(t))$  in simplest form.
- Find the area after 4 seconds, to the nearest tenth.
- At what time is the area  $81\pi$  square feet?

### Problem 24: Inverse of a composition

Let  $f(x) = 2x + 1$  and  $g(x) = x - 4$ .

- Find  $f(g(x))$  and its inverse function.
- Find  $f^{-1}(x)$  and  $g^{-1}(x)$ , then simplify  $g^{-1}(f^{-1}(x))$ .
- Compare your results from (a) and (b).

## How to use this precalculus functions review worksheet

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Print this precalculus functions review worksheet as a PDF, solve every problem on paper, then compare with the answer key.

