

Domains, Composition and Inverse Functions Explained

Grade 12 – Precalculus math · Worksheet · Standards: F-IF.A.1, F-BF.A.1c, F-BF.B.4b, F-BF.B.4c, F-BF.B.4d

Name: _____ Date: _____ Class: _____

These 20 problems build from function notation and interval-notation domains to composition, decomposition, verifying and finding inverses, and restricting domains. They train standards F-IF.A.1, F-BF.A.1c and F-BF.B.4b through F-BF.B.4d. The last six problems use taxi fares, ripples and cabin costs, so each inverse and composite carries real meaning.

Standards: F-IF.A.1, F-BF.A.1c, F-BF.B.4b, F-BF.B.4c, F-BF.B.4d · **Level:** Grade 12 Precalculus

Problem 1 Evaluate with Function Notation (easy)

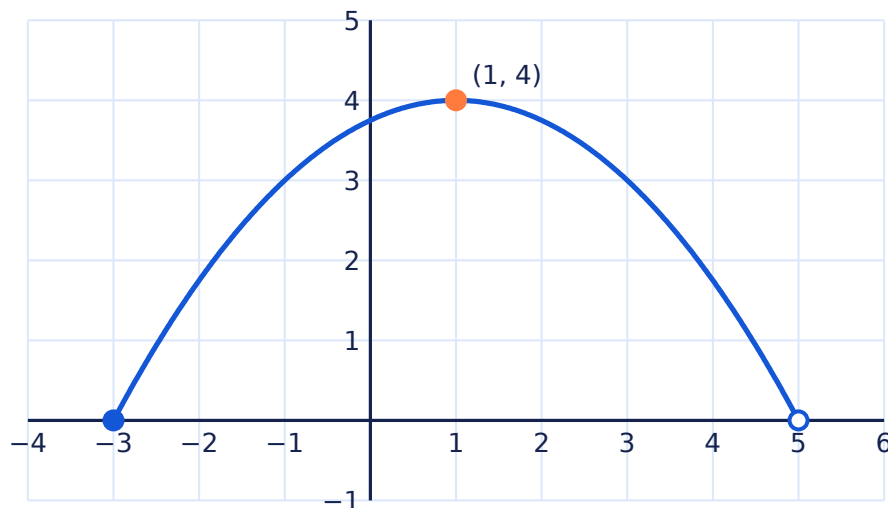
Let $f(x) = 2x^2 - 5x + 7$. Find $f(-3)$ and $f(4)$.

Problem 2 Domain Using Two Restrictions (easy)

Write the domain in interval notation. (a) $g(x) = \sqrt{4x + 9}$ (b) $h(x) = \frac{1}{x+6}$

Problem 3 Domain and Range from a Graph (easy)

The graph shows a function with a closed dot at $(-3, 0)$, a maximum at $(1, 4)$, and an open dot at $(5, 0)$. State the domain and the range in interval notation.



Problem 4 Evaluate Two Compositions (easy)

Let $f(x) = x^2 - 3$ and $g(x) = 4x + 1$. Find $f(g(2))$ and $g(f(2))$.

Problem 5 Build Composite Functions (easy)

Let $f(x) = 6x + 1$ and $g(x) = x^2 - 4$. Write $(f \circ g)(x)$ and $(g \circ f)(x)$ in simplest form.

Problem 6 Inverse of a Linear Function (easy)

Find the inverse of $f(x) = \frac{5}{4}x + 3$.

Problem 7 Reading Inverse Values from a Table (medium)

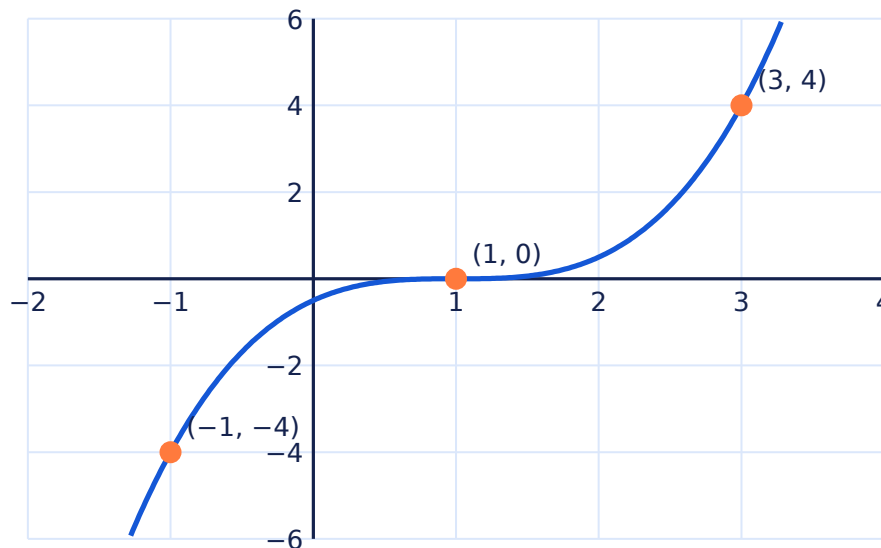
A one-to-one function f has this table.

x	0	2	5	8	11
$f(x)$	4	9	15	22	30

Find $f^{-1}(15)$, $f^{-1}(30)$ and $f(f^{-1}(22))$. Then explain whether $f^{-1}(10)$ can be found from the table.

Problem 8 Inverse Values from a Graph (medium)

The graph of f passes through $(-1, -4)$, $(1, 0)$ and $(3, 4)$. Use it to find $f^{-1}(4)$, $f^{-1}(0)$ and $f^{-1}(-4)$.



Graph of f .

Problem 9 Domain of a Root over a Binomial (medium)

Find the domain of $k(x) = \sqrt[3]{(x+5)/(x-2)}$ in interval notation.

Problem 10 Verify Inverse Functions (medium)

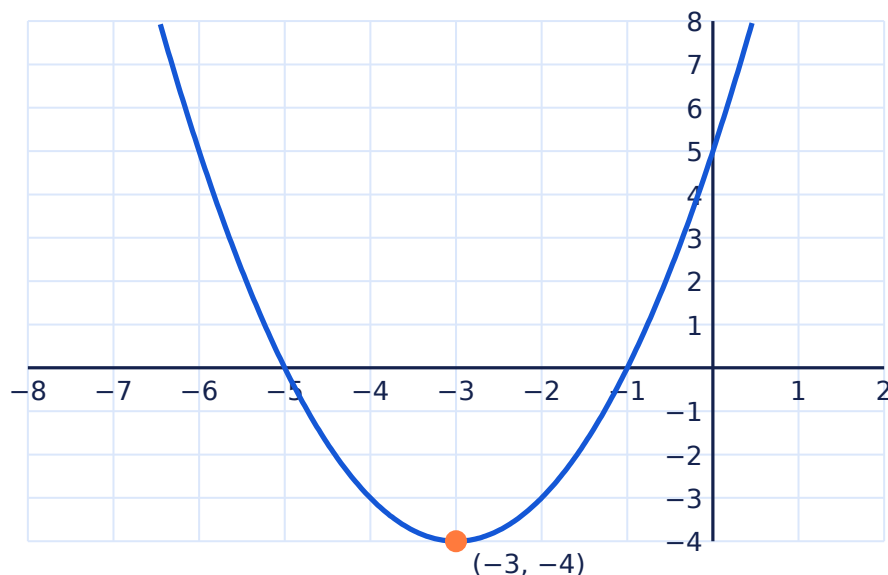
Show that $f(x) = 2x^3 + 1$ and $g(x) = \sqrt[3]{(x-1)/2}$ are inverses of each other.

Problem 11 Decompose a Composite Function (medium)

Write each function as $f(g(x))$ with a simple inner and outer function. (a) $h(x) = (5x - 2)^4$ (b) $k(x) = \sqrt[3]{x^2 + 9}$

Problem 12 Restrict, Then Invert (medium)

The graph of $f(x) = (x + 3)^2 - 4$ is shown. Restrict the domain to $x \geq -3$ and find the inverse, with its domain and range.



Parabola with vertex $(-3, -4)$.

Problem 13 Inverse of a Rational Function (medium)

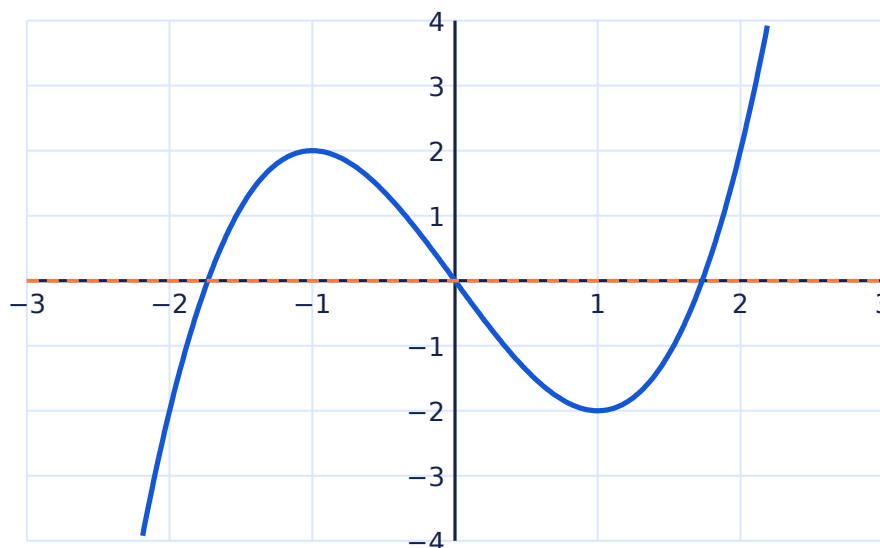
Find the inverse of $f(x) = \sqrt[3]{(x+1)/(x-4)}$ and state which input is excluded from the domain of f^{-1} .

Problem 14 Domain of a Composite (medium)

Let $f(x) = \sqrt{x-1}$ and $g(x) = x^2 - 10$. Find $(f \circ g)(x)$ and its domain.

Problem 15 Horizontal Line Test and Restriction (hard)

The graph of $g(x) = x^3 - 3x$ is shown with the line $y = 0$. (a) Name three inputs that share the output 0. (b) Give one interval on which g is one-to-one.



The dashed line $y = 0$ cuts the curve three times.

Problem 16 Taxi Fare and Its Inverse (hard)

A taxi charges $f(m) = 2.50 + 1.75m$ dollars for a ride of m miles. Write the inverse, say what it computes, and find the length of a ride that costs \$23.50.

Problem 17 Lemonade Stand Revenue (hard)

A stand sells $c(t) = 12t + 8$ cups in t hours. Profit in dollars from c cups is $r(c) = 1.75c - 20$. Write $r(c(t))$, find the profit after 5 hours, and find the time needed to reach \$162.

Problem 18 Spreading Ripple Area (hard)

A circular ripple has radius $r(t) = 4 + 3t$ feet after t seconds, and area $A(r) = \pi r^2$. Write $A(r(t))$, find the area at $t = 2$, and find t when the area is 169π square feet.

Problem 19 Cabin Cost Split (hard)

A \$480 cabin rental is split equally among $n + 4$ campers (n students plus 4 counselors), so each pays $s(n) = \frac{480}{n+4}$ dollars. Find the inverse, describe what it gives, and find n when each camper pays \$32.

Problem 20 Restrict, Invert and Evaluate (hard)

Let $f(x) = 2x + 3$ and $g(x) = x^2 - 1$. Find $h = f \circ g$, restrict it to $x \geq 0$, find h^{-1} , and evaluate $h^{-1}(19)$.