Finding the Inverse of a Function Algebraically

Algebra 2 Worksheet · Grade 9–11

Name: _____ Date: _____

Learning Objectives

- Find the inverse of a function by swapping x and y and solving for y
- Apply domain restrictions when determining the correct form of an inverse function
- Verify inverse functions using composition

Problems

1. Find the inverse of the function below:

$f(x) = x + 5$

2. Find the inverse of the function below:

$f(x) = 3x - 7$

3. Find the inverse of the function below, given that the domain is all x greater than or equal to 0:

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

4. Find the inverse of the function below:

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

5. Find the inverse of the function below:

$f(x) = \sqrt{x - 4}$

6. Find the inverse of the function below:

$f(x) = (x + 3)^3$

Scan to watch

7. Find the inverse of the function below, given that x is less than or equal to 2:

$$f(x) = (x-2)^2 + 1$$

8. Find the inverse of the function below:

$$f(x) = \frac{2x+1}{3}$$

9. Find the inverse of the function below:

$$f(x) = \sqrt[3]{x+5} - 2$$

10. Find the inverse of the function below, then verify by computing f composed with f-inverse:

$$f(x) = \frac{x-1}{x+2}$$

Scan to watch

Finding the Inverse of a Function Algebraically — Answer Key

Algebra 2 Worksheet · Grade 9–11

Answer Key

1. Answer: f■⁻¹(x) = x – 5

- Replace f(x) with y: y = x + 5
- Swap x and y: x = y + 5
- Solve for y: y = x – 5
- Write as inverse: f■⁻¹(x) = x – 5

2. Answer: f■⁻¹(x) = (x + 7) / 3

- Replace f(x) with y: y = 3x – 7
- Swap x and y: x = 3y – 7
- Add 7 to both sides: x + 7 = 3y
- Divide both sides by 3: y = (x + 7) / 3
- Write as inverse: f■⁻¹(x) = (x + 7) / 3

3. Answer: f■⁻¹(x) = √(x – 3)

- Replace f(x) with y: y = x² + 3
- Swap x and y: x = y² + 3
- Subtract 3 from both sides: x – 3 = y²
- Take the square root of both sides: y = ±√(x – 3)
- Since domain restriction x ≥ 0, take positive root: f■⁻¹(x) = √(x – 3)

4. Answer: f■⁻¹(x) = ■(x – 2)

- Replace f(x) with y: y = x³ + 2
- Swap x and y: x = y³ + 2
- Subtract 2 from both sides: x – 2 = y³
- Take the cube root of both sides: y = ■(x – 2)
- Write as inverse: f■⁻¹(x) = ■(x – 2)

5. Answer: f■⁻¹(x) = x² + 4

- Replace f(x) with y: y = √(x – 4)
- Swap x and y: x = √(y – 4)
- Square both sides: x² = y – 4
- Add 4 to both sides: y = x² + 4
- Write as inverse: f■⁻¹(x) = x² + 4

6. Answer: f■⁻¹(x) = ■x – 3

- Replace f(x) with y: y = (x + 3)³
- Swap x and y: x = (y + 3)³

Scan to watch

- Take the cube root of both sides: ■x = y + 3
- Subtract 3 from both sides: y = ■x – 3
- Write as inverse: f■⁻¹(x) = ■x – 3

---

7. Answer: f■⁻¹(x) = 2 – √(x – 1)

- Replace f(x) with y: y = (x – 2)² + 1
- Swap x and y: x = (y – 2)² + 1
- Subtract 1: x – 1 = (y – 2)²
- Take the square root: ±√(x – 1) = y – 2
- Since domain restriction x ≤ 2, use negative root: y = 2 – √(x – 1)
- Write as inverse: f■⁻¹(x) = 2 – √(x – 1)

---

8. Answer: f■⁻¹(x) = (3x – 1) / 2

- Replace f(x) with y: y = (2x + 1) / 3
- Swap x and y: x = (2y + 1) / 3
- Multiply both sides by 3: 3x = 2y + 1
- Subtract 1: 3x – 1 = 2y
- Divide by 2: y = (3x – 1) / 2
- Write as inverse: f■⁻¹(x) = (3x – 1) / 2

---

9. Answer: f■⁻¹(x) = (x + 2)³ – 5

- Replace f(x) with y: y = ■(x + 5) – 2
- Swap x and y: x = ■(y + 5) – 2
- Add 2 to both sides: x + 2 = ■(y + 5)
- Cube both sides: (x + 2)³ = y + 5
- Subtract 5: y = (x + 2)³ – 5
- Write as inverse: f■⁻¹(x) = (x + 2)³ – 5

---

10. Answer: f■⁻¹(x) = (–2x – 1) / (x – 1)

- Replace f(x) with y: y = (x – 1) / (x + 2)
- Swap x and y: x = (y – 1) / (y + 2)
- Multiply both sides by (y + 2): x(y + 2) = y – 1
- Expand: xy + 2x = y – 1
- Collect y terms: xy – y = –2x – 1
- Factor: y(x – 1) = –2x – 1
- Divide: y = (–2x – 1) / (x – 1)
- Write as inverse: f■⁻¹(x) = (–2x – 1) / (x – 1)
- Verify: f(f■⁻¹(x)) = x ✓

Scan to watch