

LESSON

Practice B

9-5 Functions and Their Inverses

Find the inverse of each function. Determine whether the inverse is a function and state its domain and range.

1. $k(x) = 10x + 5$

2. $d(x) = 6 - 2x$

3. $f(x) = (x - 5)^2$

4. $g(x) = \frac{4 - x}{2}$

5. $h(x) = \sqrt{x^2 - 9}$

6. $b(x) = 2\log x$

Determine by composition whether each pair of functions are inverses.

7. $q(x) = \sqrt{x} - 4$
and $r(x) = x^2 + 4$ for $x \geq 0$

8. $s(x) = \frac{2}{x - 2}$ and $t(x) = \frac{x + 2}{-2}$

9. $u(x) = \frac{x^2}{4} - 1$ for $x \geq -1$
and $v(x) = \pm 2\sqrt{x + 1}$

10. $A(x) = \log(x - 1)^4$
and $B(x) = 1 + \log^{-1}\left(\frac{x}{4}\right)$

Solve.

11. So far, Rhonda has saved \$3000 for her college expenses. She plans to save \$30 each month. Her college fund can be represented by the function $f(x) = 30x + 3000$.

a. Find the inverse of $f(x)$.

b. What does the inverse represent?

c. When will the fund reach \$3990?

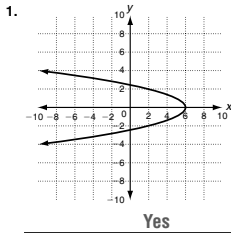
d. How long will it take her to reach her goal of \$4800?

LESSON

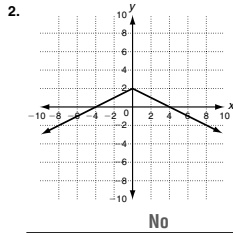
Practice A

9-5 Functions and Their Inverses

Use the horizontal line test to determine whether the inverse of each relation is a function.



Yes



No

Find the inverse of each function. State whether the inverse is a function.

3. $f(x) = 2x - 6$

- a. Substitute y for $f(x)$.
- b. Switch x and y .

$y = 2x - 6$

$x = 2y - 6$

- c. Solve for y . This is the inverse.

$y = \frac{x+6}{2}$

- d. Graph the original function using a graphing calculator. Is the inverse a function?

yes

4. $g(x) = x + 9$

$g^{-1}(x) = x - 9$; yes

5. $h(x) = \frac{x}{2} - 1$

$h^{-1}(x) = 2x + 2$; yes

6. $p(x) = x^2 + 1$

$p^{-1}(x) = \pm\sqrt{x-1}$; no

7. $b(x) = \sqrt{x+7}$

$b^{-1}(x) = x^2 - 7$; yes, for $x \geq -7$

Solve.

- 8. The total cost of a jacket, including 8% tax, can be found by using the function $T(x) = 1.08x$.

- a. Find the inverse of $T(x)$.

$T^{-1}(x) = \frac{x}{1.08}$

The price of the jacket

- b. What does the inverse represent?

- c. Tia wants to return a jacket. She paid a total of \$102.60 for it. What was the price of the jacket?

\$95

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LESSON

Practice B

9-5 Functions and Their Inverses

Find the inverse of each function. Determine whether the inverse is a function and state its domain and range.

1. $k(x) = 10x + 5$

$k^{-1}(x) = \frac{x-5}{10}$; function

domain: $(-\infty, +\infty)$

range: $(-\infty, +\infty)$

2. $d(x) = 6 - 2x$

$d^{-1}(x) = -\frac{x}{2} + 3$; function

domain: $(-\infty, +\infty)$

range: $(-\infty, +\infty)$

3. $f(x) = (x-5)^2$

$y = 5 \pm \sqrt{x}$; not a function

domain: $(-\infty, +\infty)$

range: $[0, +\infty)$

4. $g(x) = \frac{4-x}{2}$

$g^{-1}(x) = -2x + 4$; function

domain: $(-\infty, +\infty)$

range: $(-\infty, +\infty)$

5. $h(x) = \sqrt{x^2 - 9}$

$h^{-1}(x) = \pm\sqrt{x^2 + 9}$; not a function

domain: $[0, +\infty)$

range: $(-\infty, -3]$ and $[3, +\infty)$

6. $b(x) = 2\log x$

$b^{-1}(x) = \log^{-1} \frac{x}{2}$ or $b^{-1}(x) = 10^{\frac{x}{2}}$; function; domain: $(-\infty, +\infty)$

range: $[0, +\infty)$

Determine by composition whether each pair of functions are inverses.

7. $q(x) = \sqrt{x} - 4$

and $r(x) = x^2 + 4$ for $x \geq 0$

No

8. $s(x) = \frac{2}{x-2}$ and $t(x) = \frac{x+2}{-2}$

No

9. $u(x) = \frac{x^2}{4} - 1$ for $x \geq -1$

and $v(x) = \pm 2\sqrt{x+1}$

Yes

10. $A(x) = \log(x-1)^4$

and $B(x) = 1 + \log^{-1}(\frac{x}{4})$

Yes

Solve.

- 11. So far, Rhonda has saved \$3000 for her college expenses. She plans to save \$30 each month. Her college fund can be represented by the function $f(x) = 30x + 3000$.

$f^{-1}(x) = \frac{1}{30}x - 100$

- a. Find the inverse of $f(x)$.

Number of months she has saved

33 months

- b. What does the inverse represent?

- c. When will the fund reach \$3990?

- d. How long will it take her to reach her goal of \$4800?

5 years

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LESSON

Practice C

9-5 Functions and Their Inverses

Find the inverse of each function. Determine whether the inverse is a function and state its domain and range.

1. $A(x) = \frac{9-2x}{5}$

$A^{-1}(x) = -2.5x + 4.5$; function

domain: $(-\infty, +\infty)$

range: $(-\infty, +\infty)$

2. $B(x) = \frac{3+x}{x}$

$B^{-1}(x) = \frac{3}{x-1}$; function

domain: $(-\infty, 1)$ and $(1, +\infty)$

range: $(-\infty, 0)$ and $(0, +\infty)$

3. $C(x) = 25 - x^2$

$C^{-1}(x) = \pm\sqrt{25-x}$

not a function; domain: $(-\infty, 25]$

range: $(-\infty, +\infty)$

4. $D(x) = 2 - \log x^3$

$D^{-1}(x) = \log^{-1}(\frac{-x+2}{3})$; not a function; domain: $(-\infty, +\infty)$

range: $(-\infty, 0)$ and $(0, +\infty)$

5. $E(x) = \frac{x}{x+2}$

$E^{-1}(x) = \frac{2x}{1-x}$; not a function

domain: $(-\infty, -2)$ and $(-2, +\infty)$

range: $(-\infty, 1)$ and $(1, +\infty)$

6. $F(x) = 4 + \sqrt{2x-1}$

$F^{-1}(x) = 0.5x^2 - 4x + 8.5$

function; domain: $[4, +\infty)$

range: $[0.5, +\infty)$

Determine by composition whether each pair of functions are inverses.

7. $p(x) = \sqrt{5-x^2}$ for $|x| \leq 5$

and $q(x) = \sqrt{5-x^2}$ for $|x| \leq 5$

no

8. $s(x) = \frac{-2x}{x-2}$

and $t(x) = \frac{2x}{2-x}$

yes

9. $u(x) = \frac{1}{(x-3)^2}$ for $x > 3$

and $v(x) = 3 + \frac{\sqrt{x}}{x}$ for $x > 0$

yes

10. $b(x) = \log(x-1)^4$

and $d(x) = 1 + 10^{\frac{x}{4}}$ for $x \geq 1$

yes

Solve.

- 11. The area of a regular octagon can be found by using the formula $A(s) = 2s^2(\sqrt{2} + 1)$, where s is the length of each side.

- a. Find the inverse of $A(s)$.

$s = \pm\sqrt{\frac{A}{2(\sqrt{2} + 1)}}$

- b. What does the inverse represent?

Side length

- c. What is the side length of a regular octagon whose area is $(9.68\sqrt{2} + 9.68)$ m²?

2.2 meters

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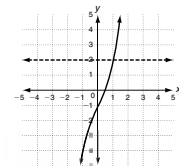
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Reteach

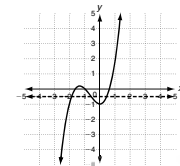
9-5 Functions and Their Inverses

Not all relations are functions and not all relations have inverse functions. To decide whether the inverse of a relation is a function, use the horizontal-line test.

If any horizontal line passes through more than one point on the graph of a relation, the inverse of the relation is not a function.

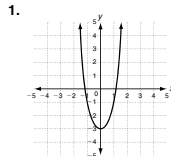


Can you draw a horizontal line that passes through more than one point on the graph?
No. So the inverse of the relation is a function.

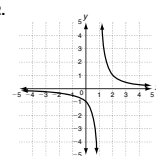


Can you draw a horizontal line that passes through more than one point on the graph?
Yes. So the inverse of the relation is NOT a function.

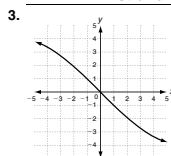
Use the horizontal-line test to determine whether the inverse of each relation is a function.



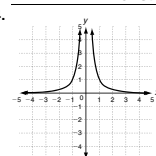
Not a function



Function



Function



Not a function

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