

Homework Questions for 1.4

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Ready, Set, Go!

Ready
Topic: Properties of exponents

Use the product rule or the quotient rule to simplify. Leave all answers in exponential form with only positive exponents.

1. $3^6 \cdot 3^5$ 2. $2^3 \cdot 2^7$ 3. $7^2 \cdot 7^6$

4. $10^{-4} \cdot 10^7$ 5. $5^9 \cdot 5^{-6}$ 6. $p^2 p^5$

7. $2^6 \cdot 2^{-3} \cdot 2^1$ 8. $b^{11} b^{-5}$


9. $\frac{7^5}{7^2}$ 10. $\frac{9^8}{9}$ 11. $\frac{3^5}{3^8}$ 12. $\frac{7^{-4}}{7^{-8}}$ 13. $\frac{p^{-3}}{p^5}$

Handwritten notes:
 7. $2^{6+(-3)+1} = 2^4$
 8. $b^{11-5} = b^6$
 9. $7^{5-2} = 7^3$
 10. 9^8
 11. $3^{5-8} = 3^{-3} = \frac{1}{3^3}$
 12. $7^{-4-(-8)} = 7^{-4+8} = 7^4$
 13. $p^{-3-5} = p^{-8} = \frac{1}{p^8}$

Set
Topic: Inverse functions

15. Given the functions $f(x) = \sqrt{x} - 1$ and $g(x) = x^2 + 7$:

a. Calculate $f(16)$ and $g(3)$.



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Match the function in the first column with its inverse in the second column.

$f(x)$	$f^{-1}(x)$
16. $f(x) = 3x + 5$	a. $f^{-1} = \log_x 5$
17. $f(x) = x^5$	b. $f^{-1} = \sqrt[3]{x}$
18. $f(x) = \sqrt[3]{x-3}$	c. $f^{-1}(x) = \frac{x-5}{3}$
19. $f(x) = x^3$	d. $f^{-1}(x) = \frac{x}{3} - 5$
20. $f(x) = 5^x$	e. $f^{-1} = \log_x 3$
21. $f(x) = 3(x+5)$	f. $f^{-1} = x^5 + 3$
22. $f(x) = 3^x$	g. $f^{-1} = \sqrt[3]{x}$

Handwritten notes:
 - Red lines connect 16 to c, 17 to b, 18 to d, 19 to f, 20 to e, and 22 to g.
 - Red annotations: $\log_5 x$ next to a, $\log_3 x$ next to e.

Go
Topic: Composite functions and inverses

Calculate $f(g(x))$ and $g(f(x))$ for each pair of functions.
(Note: the notation $(f \circ g)(x)$ and $(g \circ f)(x)$ mean the same thing as $f(g(x))$ and $g(f(x))$, respectively.)

23. $f(x) = 2x + 5$	$g(x) = \frac{x-5}{3}$	24. $f(x) = (x+2)^3$	$g(x) = \sqrt[3]{x} - 2$
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$g(x) = \frac{4(x-6)}{3}$

26. $f(x) = \frac{-3}{x-2} + 2$

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

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Lesson 1.5 Inverse Universe:

Match Each 'A' Function to a 'B' Function

A1

$f(x) = \begin{cases} -2x + 18, & -5 < x < 0 \\ -2, & x \geq 0 \end{cases}$

A. $y = -2$

inverse $x = -2$ when $y = 0$

TYPO! but...
 $y = -2$ and $x = -2$
are inverses.

\rightleftarrows

B7

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A2

The function increases at a constant rate of $\frac{a}{b}$ and the y-intercept is $(0, c)$.
slope

B3

The x-intercept is $(c, 0)$ and the slope of the line is $\frac{b}{a}$.

A2 & B3 are inverses because they have reciprocal slopes $\frac{a}{b}$ & $\frac{b}{a}$ and $(0, c)$ & $(c, 0)$ have been switched.

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A3

Can convert to graph, equation, or table.

Each input value, x, is squared and then 3 is added to the result. The domain of the function is $[0, \infty)$

HAVE $y = x^2 + 3$

INVERSE? $x = y^2 + 3$

$\sqrt{x-3} = y^2$

$\sqrt{x-3} = y$

x	y
0	3
1	4
2	7
3	12

B6

$x = y^2 + 3$


x	y
3	0
4	1
7	2
12	3
19	4
28	5
39	6

$\sqrt{x-3} = y$

A3 & B6 are inverses because A3's equation is $x^2 + 3 = y$ and if I make a table then switch x & y I get B6. I also could use the equation to get the inverse equation and prove that it can be used to create B6.

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A4



x	f(x)
-3	-2
-2	-1
1	0
6	1

B8

x	y
-2	-3
-1	-2
0	1
1	6
2	13

switch x & y

A4 & B8 are a match because if you use some points from the graph and switch x & y then you get the table in B8.

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A5

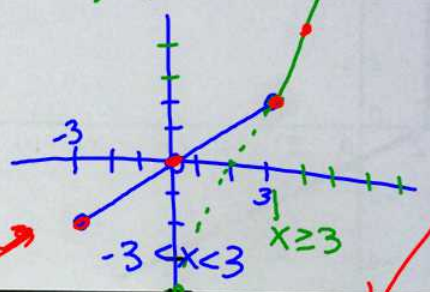
HAVE

x	in order	y
-2	-3	-3
2	-2	3
0	0	0
6	3	5
4	4	4
-4	5	-2
3	6	-3

WANT in inverse

(make inverse table)

B2

$$f(x) = \begin{cases} y = \frac{2}{3}x + 0 & \text{between } -3 < x < 3 \\ y = 2x - 4, & x \geq 3 \end{cases}$$


-3 < x < 3 → so use $y = \frac{2}{3}x$

x ≥ 3 so use $y = 2x - 4$

$y = \frac{2}{3}(-2) = -\frac{4}{3} \checkmark$
 $y = 2(4) - 4 = 4 \checkmark$

A5 & B2 match because if you switch x & y in the table those points are on the graph and the equats are true @ those points.

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A6

find inverse:
 $y = 3^x$
 $x = \log_3 y$
 $\log_3 x = y$

B1

$y = \log_3 x$

→

A6 & B1 match because $y = 3^x$ & $y = \log_3 x$ are inverses.

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A7

x	y
	x^3
-5	-125
-3	-27
-1	-1
1	1
3	27
5	125

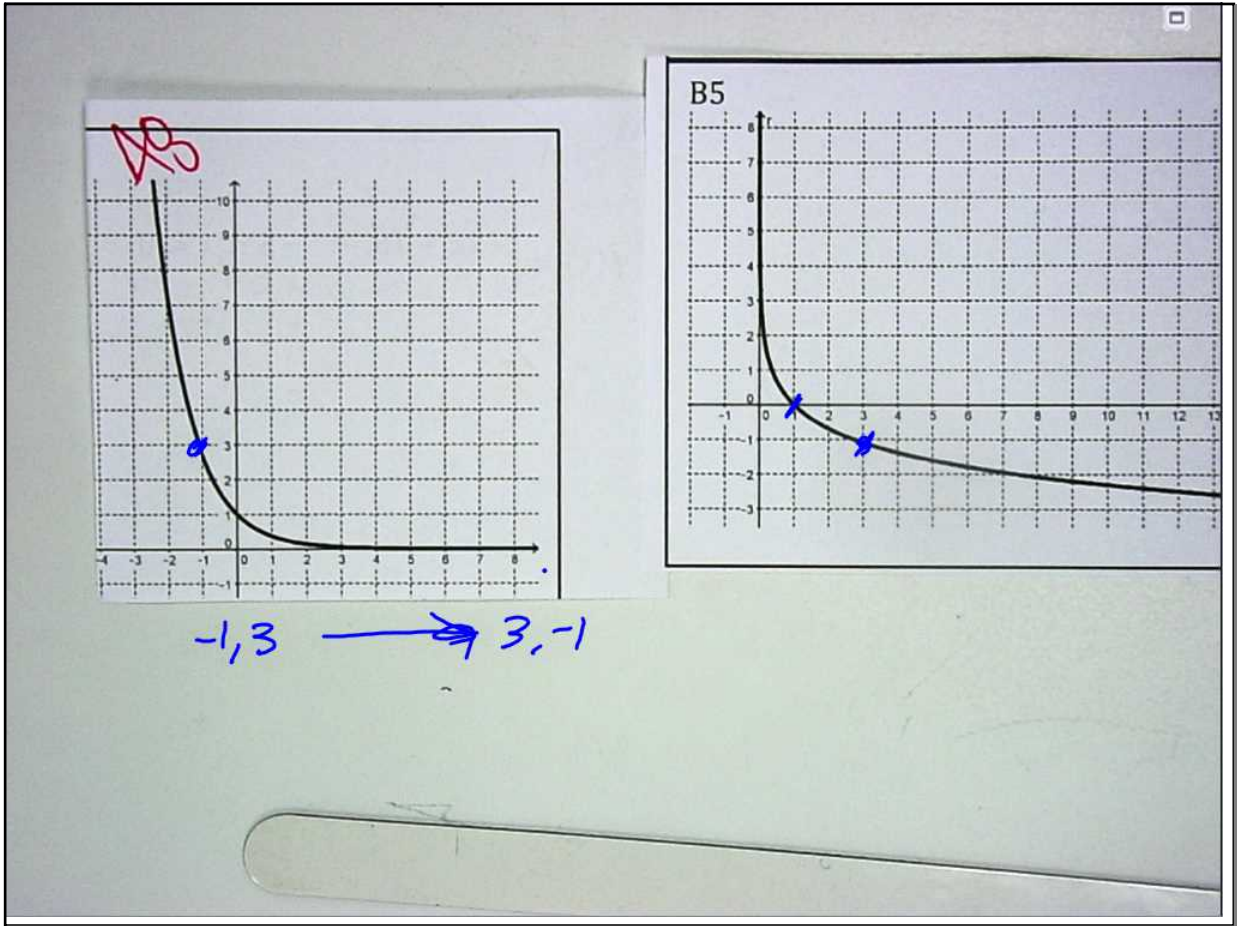
B4

$\sqrt[3]{x} = y$ or $x = y^3$

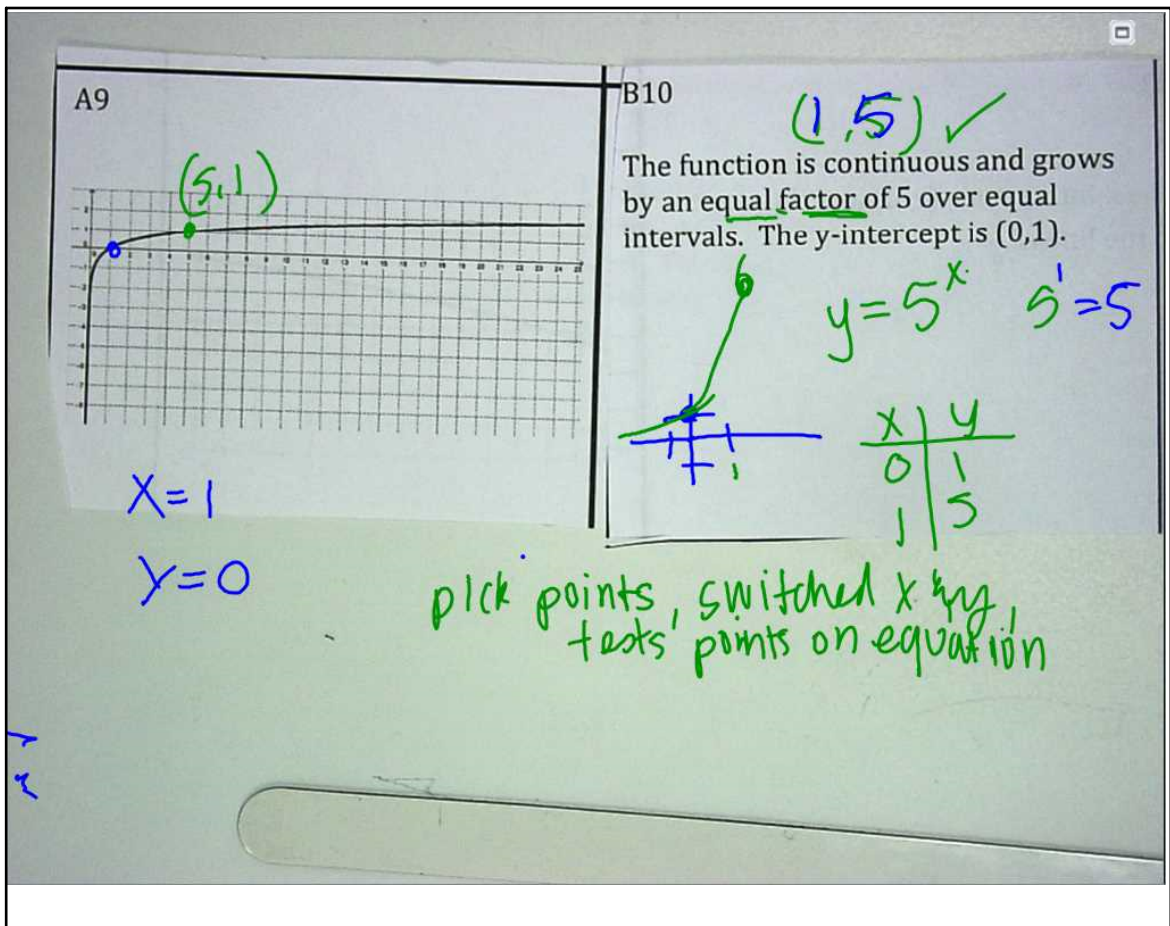
x	y
-216	-6
-64	-4 ✓
-8	-2 ✓ ←
0	0
8	2
64	4
216	6

How do I know if this point is in this table?
 What is happening to the x so that I get y? Equation?
 increasing quick so try multiply exponents
 An 1 multiplying? Not constant.
 Using exponents? $3^3 = 27$, $5^3 = 125$
 Equation $x^3 = y$ INVERSE → $\sqrt[3]{x} = y$
 match because $x^3 = y$ is the inverse to $\sqrt[3]{x} = y$
 A7 & B4

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A10 **HAVE**

Yasmin started a savings account with \$5. At the end of each week, she added 3. This function models the amount of money in the account for a given week.

x	y
0	5
1	8
2	11

$y = 5 + 3x$

switch table →

B9

WANT	
x	y
5	0
8	1
11	2

check ↗

A10 & B9 are inverses because A10 describes a table which matches the table of the graph in B9 (with x & y switched)

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exponents. Homework Help 1.5

1. $\sqrt[2]{x^2} \cdot \sqrt[3]{x^3}$

2. $\sqrt[3]{x} \cdot \sqrt[4]{x} \cdot \sqrt[6]{x}$

3. $\sqrt[6]{a} \cdot \sqrt[3]{a^2} \cdot \sqrt[5]{b^3}$

6. $(5^2)^3$

*remember

$\sqrt{x} = x^{1/2}$

$\sqrt[3]{x} = x^{1/3}$

$\sqrt[n]{x} = x^{1/n}$

change so each are the same base each is a factor of 2.

#5 $\sqrt[4]{8} \cdot \sqrt[3]{16} \cdot \sqrt[6]{2}$

get common denominator

$3 \left(\frac{3}{4} + \frac{4}{3} + \frac{1}{6} \right) = 27$

$\frac{9}{12} + \frac{16}{12} + \frac{2}{12} = \frac{27}{12}$

$\frac{27}{12} = \frac{9}{4} \rightarrow 2 \frac{1}{4}$

#8 $(3^{-4})^{-5}$

or just $-4x-5 \rightarrow 3^{-4} \cdot 3^{-4} \cdot 3^{-4} \cdot 3^{-4} \cdot 3^{-4} = 3^{20}$

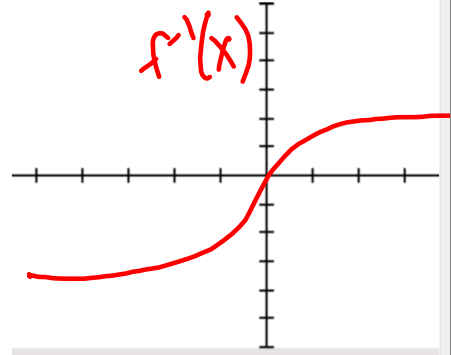
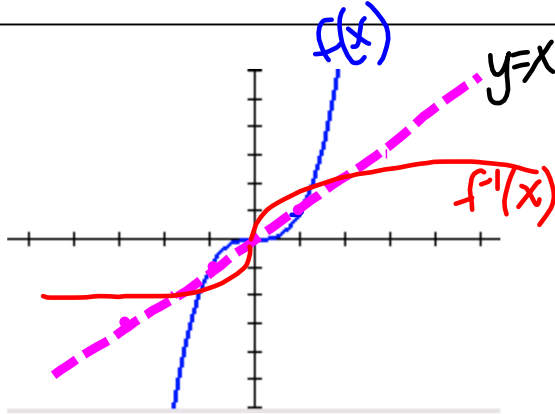
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find the INVERSE

12. $f(x) = -2x + 4$

13. $f(x) = \log_3 x$

14.



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Topic: Composite functions

Calculate $f(g(x))$ and $g(f(x))$ for each pair of functions.

(Note: the notation $(f \circ g)(x)$ and $(g \circ f)(x)$ mean the same thing, respectively.)

16. $f(x) = 3x + 7$; $g(x) = -4x - 11$

17. $f(x) = -4x + 60$; $g(x) = -\frac{1}{4}x + 15$

18. $f(x) = 10x - 5$; $g(x) = \frac{2}{5}x + 3$

19. $f(x) = -\frac{2}{3}x + 4$; $g(x) = -\frac{3}{2}x + 6$

$$f(g(x)) = -\frac{2}{3}\left(-\frac{3}{2}x + 6\right) + 4$$

$$= x - 4 + 4 = x$$

$$g(f(x)) = -\frac{3}{2}\left(-\frac{2}{3}x + 4\right) + 6$$

$$= 1x - 6 + 6 = x$$

✓ INVERSES

20. Look back at your calculations for $f(g(x))$ and $g(f(x))$. Two of the pairs of equations are inverses of each other. Which ones do you think they are?

Why?

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