Welcome! Please have your homework out to check and FIX! get a highlighter!

Next:

6.4 Homework Quiz

Rational Exponents, Radical form, exponent properties, etc.)

Simplify. Give your answer in rational exponent form and in simplified radical form.

A $-4\sqrt{x} \cdot 8\sqrt[4]{x^3}$

B $\left(25x^{3/5}\right)^{1/2}$

C $(81)^{\frac{3}{4}} + (-27)^{\frac{2}{3}}$

D $16^{-3/4}$

Simplify. Give your answer in rational exponent form and in simplified radical form.

A) $-4\sqrt{x} \cdot 8\sqrt[4]{x^3}$

$-4x^{\frac{1}{2}} \cdot 8x^{\frac{3}{4}}$

$-4x^{\frac{2}{4}} \cdot 8x^{\frac{3}{4}}$

$-32x^{5/4}$

$-32\sqrt[4]{x^5}$

$-32x\sqrt[4]{x}$

B) $(25x^{3/5})^{1/2} = 25^{\frac{1}{2}}x^{\frac{3}{10}} = 5x^{\frac{3}{10}}$

$5\sqrt[10]{x^3}$

C) $(81)^{\frac{3}{4}} + (-27)^{\frac{2}{3}}$

$(\sqrt[4]{81})^3 + (\sqrt[3]{-27})^2$

$3^3 + (-3)^2 \quad 27 + 9 = 36$

D) $16^{-3/4} = \frac{1}{16^{3/4}} = \frac{1}{(\sqrt[4]{16})^3} = \frac{1}{2^3}$

$= \frac{1}{8}$

6.4 Introduction Problems **Name:** YMMG + Key

Simplify: Give your answer in rational exponent form and simplified radical form.

$x^{\frac{1}{3}} \cdot x^{\frac{2}{5}}$

CD: 15

$x^{\frac{5}{15}} \cdot x^{\frac{6}{15}}$

$\boxed{x^{\frac{11}{15}}}$ $\boxed{\sqrt[15]{x^{11}}}$

$\frac{2x^{\frac{3}{8}}}{10x^{\frac{1}{4}}}$

LCD = 8

$\frac{1\,\cancel{2}x^{\frac{3}{8}}}{5\,\cancel{10}x^{\frac{2}{8}}}$

$\boxed{\frac{x^{\frac{1}{8}}}{5}}$ $\boxed{\frac{\sqrt[8]{x}}{5}}$

$\left(x^{\frac{6}{5}}\right)^{\frac{1}{3}}$

$x^{\frac{6}{15}} = \boxed{x^{\frac{2}{5}}}$

$\boxed{\sqrt[5]{x^2}}$

Simplify using rational exponents. Give your final answer as an integer.

$(\sqrt[3]{4})^6$

$4^{\frac{3}{6}} = 4^{\frac{1}{2}}$

$\sqrt{4} = \boxed{2}$

$125^{\frac{2}{3}}$

$(\sqrt[3]{125})^2$

$(5)^2$

$\boxed{25}$

$(\sqrt[5]{-3})^{15}$

$(-3)^{\frac{15}{5}} = (-3)^3$

$\boxed{-27}$

$\sqrt[6]{49^3}$

$49^{\frac{3}{6}} = 49^{\frac{1}{2}}$

$\sqrt{49} = \boxed{7}$

$(-4^2)^{-\frac{3}{2}}$

$-4^{-\frac{6}{2}} = -4^{-3}$

$\frac{1}{(-4)^3} = \boxed{\frac{1}{-64}}$

Use Rational Exponents to simplify. Give your answer in rational exponent form and simplified radical form.

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

$2x^{\frac{1}{2}}\cdot x^{\frac{2}{3}}$

$2\cdot x^{\frac{3}{6}}\cdot x^{\frac{4}{6}}$

$\boxed{2x^{\frac{7}{6}}}$ $\boxed{2x\sqrt[6]{x}}$

$2\sqrt[6]{x^7}$ $x^6\cdot x$

$\frac{\cancel{3}^{1}\sqrt[6]{x^5}}{\cancel{15}_{5}\sqrt{x}}$ $\frac{13x^{\frac{5}{6}}}{5\,15x^{1/2}}$

$\frac{x^{\frac{5}{6}}}{5x^{3/6}}$ $\frac{x^{\frac{5}{6}-\frac{3}{6}}}{5}=\frac{x^{\frac{2}{6}}}{5}$

$\boxed{\frac{x^{1/3}}{5}}$ $\boxed{\frac{\sqrt[3]{x}}{5}}$

$(-2\sqrt[4]{x^3})(-6\sqrt[5]{x})$

$-2x^{3/4}\cdot -6x^{1/5}$

$+12x^{\frac{3}{4}+\frac{1}{5}}$

$12x^{\frac{15}{20}+\frac{4}{20}}$

$\boxed{12x^{\frac{19}{20}}}$ $\boxed{12\sqrt[20]{x^{19}}}$

$(-8\sqrt[3]{x^4})^2$

$\left(-8x^{\frac{4}{3}}\right)^{\frac{2}{1}}$

$(-8)^2x^{\frac{8}{3}}$

$\boxed{64x^{\frac{8}{3}}}$ $64\sqrt[3]{x^8}$

$x^3\cdot x^3\cdot x^2$

$\boxed{64x^2\sqrt[3]{x^2}}$

Part III: **Multiplying and Dividing "Un-Like" Radicals** – Use rational exponents to find a common root (common denominator) then simplify! Give your answer in rational AND radical notation.

a) $\sqrt{x}\cdot\sqrt[3]{x}$

[redacted]

b) $\frac{\sqrt[6]{x}}{\sqrt[3]{x}}$ $\frac{x^{\frac{1}{6}}}{x^{1/3}}=\frac{x^{\frac{1}{6}}}{}$

[redacted]

c) $\frac{\cancel{10}^{5}x^2\sqrt{m}}{\cancel{2}x^3\sqrt[4]{m}}$ $\frac{5m^{1/2}}{xm^{1/4}}=\frac{5m^{\frac{2}{4}}}{xm^{1/4}}$

[redacted]

d) $\left(2x^{\frac{2}{3}}\right)\left(\cdot -5x^{\frac{1}{4}}\right)$

[redacted]

e) $\frac{-100\sqrt[5]{x^3}}{}$ $-5x^{\frac{3}{5}}$

[redacted]

f) $(16x^2y^3)^{\frac{1}{4}}(8x^3y^9)^{\frac{1}{3}}$

[redacted]

Let m and n represent rational numbers. Assume that no denominator equals 0.

Property	Example	Property	Example
$a^m \cdot a^n = a^{m+n}$	$8^{\frac{1}{3}} \cdot 8^{\frac{2}{3}} = 8^{\frac{1}{3}+\frac{2}{3}} = 8^1 = 8$	$a^{-m} = \frac{1}{a^m}$	$9^{-\frac{1}{2}} = \frac{1}{9^{\frac{1}{2}}} = \frac{1}{3}$
$(a^m)^n = a^{mn}$	$(5^{\frac{1}{2}})^4 = 5^{\frac{1}{2}\cdot 4} = 5^2 = 25$	$\frac{a^m}{a^n} = a^{m-n}$	$\frac{7^{\frac{3}{2}}}{7^{\frac{1}{2}}} = 7^{\frac{3}{2}-\frac{1}{2}} = 7^1 = 7$
$(ab)^m = a^m b^m$	$(4 \cdot 5)^{\frac{1}{2}} = 4^{\frac{1}{2}} \cdot 5^{\frac{1}{2}} = 2 \cdot 5^{\frac{1}{2}}$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\left(\frac{5}{27}\right)^{\frac{1}{3}} = \frac{5^{\frac{1}{3}}}{27^{\frac{1}{3}}} = \frac{5^{\frac{1}{3}}}{3}$

Simplify the following expressions using the **properties of exponents**. Give your answer in simplified radical AND rational form.

a) $(n^4)^{\frac{3}{2}}$ $(3x^{\frac{5}{4}})(2x^{\frac{1}{2}})$ $\left(\frac{a^8}{16b^{12}}\right)^{\frac{3}{2}}$

b) $\left(16y^{-\frac{3}{5}}\right)^{-\frac{1}{4}}$ $(-12p^{\frac{1}{2}})^{-2}$ $(36a^{\frac{1}{2}})^{\frac{3}{2}}$ $36^{3/2} a^{1/2 \cdot 3/2}$

c) $(-8x\sqrt{xy})^3$ $(9x\sqrt[4]{y})^{\frac{3}{2}}$ $\frac{\sqrt[3]{-27x}}{\sqrt[6]{x^5}}$ -3

d) $\left(\frac{2\sqrt[3]{x}}{3\sqrt[4]{x}}\right)^2$ $[(-27x^2y^9)^{\frac{1}{3}}][(8x^6)]^{\frac{2}{3}}$ $\left(\sqrt[4]{(25x)^4}\right)\left(x^{\frac{2}{1}}\right)^3$

6.4 homework quiz

when you are finished, get the graphing 6.8 worksheet!

6.8 Graphing Radical Equations, Solving by Graphing

Big Idea: The graph of a radical function is made by a series of transformations to the parent functions $y = \sqrt{x}$ or $y = \sqrt[3]{x}$. These values (a, h, k) to the same transformations on quadratics and reciprocal functions.

Quadratic Function: $y = a(x-h)^2 + k$

Reciprocal Function: $y = \frac{a}{x-h} + k$

Square Root Function: $y = a\sqrt{x-h} + k$

Cube Root Function: $y = a\sqrt[3]{x-h} + k$

Recall: *What transformations do the values a, h, and k do to the parent function? Be specific, include direction!*

a	*h*	*k*

Algebra 2: Unit #6 (6.8 NOTES) Name: MMG -(Key)

6.8 Graphing Radical Equations, Solving by Graphing Block: ________

Big Idea: The graph of a radical function is made by a series of transformations to the parent functions $y = \sqrt{x}$ or $y = \sqrt[3]{x}$. These values (a, h, k) to the same transformations on quadratics and reciprocal functions.

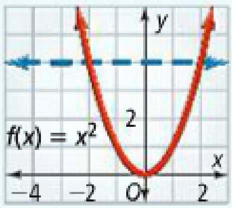
Quadratic Function: $y = a(x-h)^2 + k$	**Reciprocal Function**: $y = \frac{a}{x-h} + k$
Square Root Function: $y = a\sqrt{x-h} + k$	**Cube Root Function:** $y = a\sqrt[3]{x-h} + k$

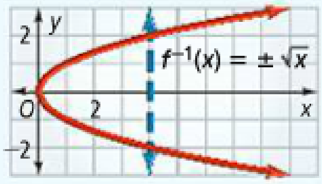
Recall: *What transformations do the values a, h, and k do to the parent function? Be specific, include direction!*

a	*h*	*k*
$a > 1$ stretch $0 < a < 1$ compress $a < 0$ reflect across x axis	horizontal shift $(x+h)$ ← left ($x = -h$) $(x-h)$ → right	vertical shift $+k$ ↑ up $-k$ ↓ down

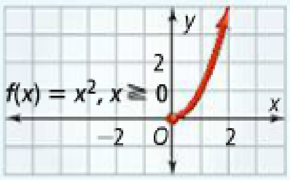
Essential Understanding A square root function is the inverse of a quadratic function that has a restricted domain.

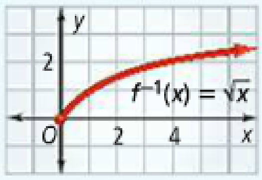
A horizontal line can intersect the graph of $f(x) = x^2$ in two points—where $f(-2) = f(2)$, for example. Thus, a vertical line can intersect the graph of f^{-1} in two points. f^{-1} is *not* a function because it fails the vertical line test.





However, you can restrict the domain of f so that the inverse of the restricted function is a function.

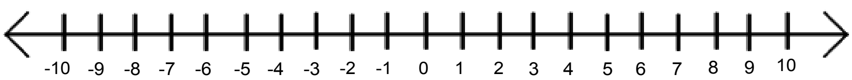




we are only graphing the principal (positive) branch of the square root so that it is a function.

INTERVAL notation review

- left to right
- [includes value]
- (does not include value)
- U union between branches



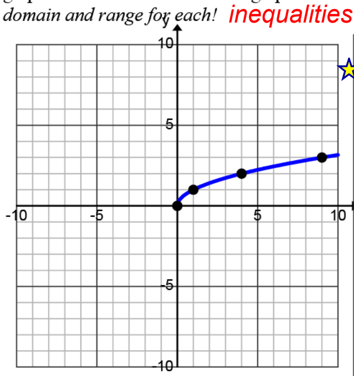
$x \geq 7$ $y \leq -8$

$y > 6$ $x < 5$

All Real numbers

To graph radicals, translate the points of the parent function. Remember the order matters: "ABC Order!"
Reflection (across x-axis) → **S**tretch/Compression →**T**ranslation (shifting horizontal/vertical)

Part I: Graphing Square Root Functions: The parent function $y = \sqrt{x}$ is graphed.Use a different color to graph each transformed function. *Identify the domain and range for each!* inequalities and interval notation!



a. $y = \sqrt{x-3}$
Domain: ________ Range: ________

b. $y = \sqrt{x+4}$
Domain: ________ Range: ________

c. $y = \sqrt{x} - 7$
Domain: ________ Range: ________

d. $y = \sqrt{x} + 5$
Domain: ________ Range: ________

e. $y = -2\sqrt{x}$
Domain: ________ Range: ________

f. $y = \frac{1}{2}\sqrt{x}$
Domain: ________ Range: ________

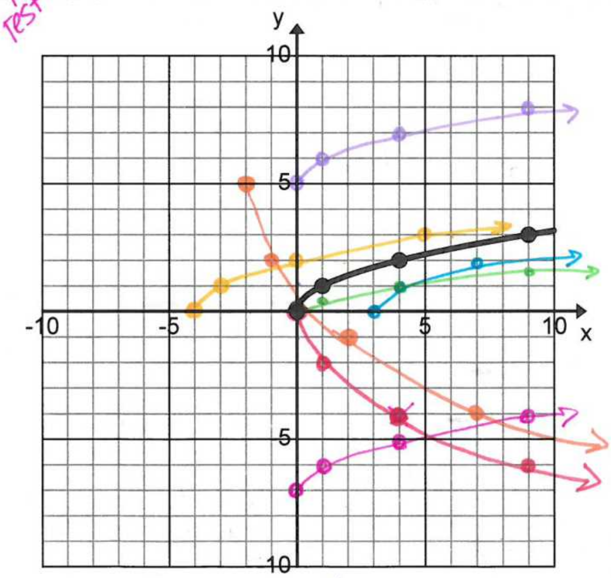
g. $y = -3\sqrt{x+2} + 5$
Domain: ________ Range: ________

Writing: How do the domain and range of square root functions relate to the transformations? How can you tell the domain and range from the rule without graphing?

To graph radicals, translate the points of the parent function. Remember the order matters: "ABC Order!"
Reflection→ **S**tretch/Compression →**T**ranslation (shifting horizontal/vertical)

Show Function from book first... Test book

Part I: Graphing Square Root Functions: The parent function $y = \sqrt{x}$ is graphed.Use a different color to graph each transformed function. *Identify the domain and range for each!* ✱ principal root ... only positives



a. $y = \sqrt{x-3}$ →3
Domain: $x \geq 3$ Range: $y \geq 0$
$[3, \infty)$ $[0, \infty)$

b. $y = \sqrt{x+4}$ ←4
Domain: $x \geq -4$ Range: $y \geq 0$
$[-4, \infty)$ $[0, \infty)$

c. $y = \sqrt{x} - 7$ ↓7
Domain: $x \geq 0$ Range: $y \geq -7$
$[0, \infty)$ $[-7, \infty)$

d. $y = \sqrt{x} + 5$ ↑5
Domain: $x \geq 0$ Range: $y \geq 5$ $[5, \infty)$
$[0, \infty)$

e. $y = -2\sqrt{x}$ reflect across x + stretch by 2
Domain: $x \geq 0$ Range: $y \leq 0$
$[0, \infty)$ $(-\infty, 0]$

f. $y = \frac{1}{2}\sqrt{x}$ compress by ½
Domain: $x \geq 0$ Range: $y \geq 0$
$[0, \infty)$ $[0, \infty)$

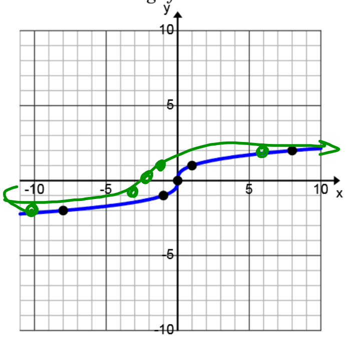
g. $y = -3\sqrt{x+2} + 5$
Domain: $x \geq -2$ Range: $y \geq 5$

Reflected across x
stretch by 3
left 2
up 5

Writing: How do D & R relate to transformations? How can you tell without graphing?

h sets the Domain, K sets range
reflection changes range to ≤

Part II: Graphing Cube Root Functions: The parent function $y = \sqrt[3]{x}$ is graphed. Use a different color to graph each transformed function. *Identify the domain and range for each!*



a. $y = \sqrt[3]{x+2}$
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

b. $y = \sqrt[3]{x-1}$
Domain: ______ Range: ______

c. $y = \sqrt[3]{x} - 6$
Domain: ______ Range: ______

d. $y = \sqrt[3]{x} + 8$
Domain: ______ Range: ______

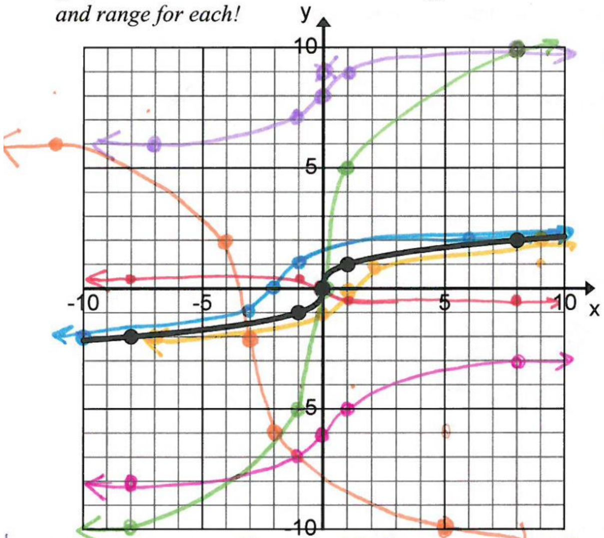
e. $y = -\frac{1}{4}\sqrt[3]{x}$
Domain: ______ Range: ______

f. $y = 5\sqrt[3]{x}$
Domain: ______ Range: ______

g. $y = -4\sqrt[3]{x+3} - 2$
Domain: ______ Range: ______

Writing: Why are the domain and range of all cubic functions the same? What other radical equations would have this domain and range?

Part II: Graphing Cube Root Functions: The parent function $y = \sqrt[3]{x}$ is graphed. Use a different color to graph each transformed function. *Identify the domain and range for each!*



a. $y = \sqrt[3]{x+2}$ ← 2
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

b. $y = \sqrt[3]{x-1}$ → 1
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

c. $y = \sqrt[3]{x} - 6$ ↓ 6
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

d. $y = \sqrt[3]{x} + 8$ ↑ 8
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

e. $y = -\frac{1}{4}\sqrt[3]{x}$ reflect across x, compress by 1/4
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

f. $y = 5\sqrt[3]{x}$ stretch by 5
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

g. $y = -4\sqrt[3]{x+3} - 2$ reflect across x, stretch by 4, ← 3, ↓ 2
Domain: $\mathbb{R}$ Range: $\mathbb{R}$

Why Domain · Range $\mathbb{R}$? (all ODD functions!) – negatives don't matter in odd functions, no restrictions

Part III: Solving a Radical Equation By Graphing (calculator allowed☺ thank Baby Gabel!)

Part III: Solving a Radical Equation By Graphing
(calculator allowed☺ thank Baby Gabel!)

On a graph, if two functions are equal, this will appear as an ________________. In the table, his will look like _______________________. Therefore, we can graph each side of an equation as a separate equation (Y1= ____ and Y2 = _____) and find this/these point(s)!

A. $\sqrt{(x+3)} = 4\sqrt{x} - 2$ B. $\sqrt[3]{x-1} = \sqrt{x} - 1$

Part III: Solving a Radical Equation By Graphing (calculator allowed☺ thank Baby Gabel!)
On a graph, if two ~~expressions~~ functions are equal, this will appear as an intersection. Therefore, we can graph each side of an equation as a separate equation (Y1= ____ and Y2 = _____) and find this point!

Examples:

A. $\sqrt{(x+3)} = 4\sqrt{x} - 2$

intersection $(1, 2)$

so $\boxed{x = 1}$ solution

B. $\sqrt[3]{x-1} = \sqrt{x} - 1$

$(0, -1)$
$(1, 0)$
$(9, 2)$

so $\boxed{x = 0, 1, 9}$

Part IV: Rewriting a Radical Function

Rewrite each function so that it is in the form $y = a\sqrt{1x-h} + k$ or $y = a\sqrt[3]{1x-h} + k$ using factoring, perfect squares/cubes, etc. Then describe all the transformations made to the parent function.

C. $y = \sqrt{36x - 72} + 4$

$y = \sqrt{36(x-2)} + 4$

$y = 6\sqrt{x-2} + 4$

D. $y = \sqrt[3]{-8x - 32} - 2$

$\sqrt[3]{-8(x+4)} - 2$

$y = -2\sqrt[3]{x+4} - 2$

E. $y = \sqrt{\frac{x+7}{16}} + 3$

$\sqrt{\frac{1}{16} \cdot x+7}$

$\sqrt{\frac{1(x+7)}{16}}$

$\frac{1}{4}\sqrt{x+7} + 3$

$\frac{1}{5}\sqrt{\frac{1(x+2)}{25}}$

HOMEWORK

Bookwork: page 418: For #17-20 (just describe the transformations), [redacted], 33, 35, 36, 45, 46, [redacted]

6.8 Graphing Homework Quiz next time!!

Part IV: Rewriting a Radical Function

Rewrite each function so that it is in the form $y = a\sqrt{1x - h} + k$ or $y = a\sqrt[3]{1x - h} + k$ using factoring, perfect squares/cubes, etc. Then describe all the transformations made to the parent function. ~~Give the domain and range~~.

Examples:

C. $y = \sqrt{36x - 72} + 4$

$y = \sqrt{36(x-2)} + 4$

$\boxed{y = 6\sqrt{x-2} + 4}$

- stretch by 6
- Right 2 units
- Up 4 units

D. $y = \sqrt[3]{-8x - 32} \cancel{+} 2$

$y = \sqrt[3]{-8(x+4)} \cancel{+} 2$

$\boxed{y = -2\sqrt[3]{x+4} - 2}$

- reflect across x axis
- stretch by 2
- left 4 units
- down 2 units

E. $y = \sqrt{\frac{x+7}{16}} + 3$

$y = \sqrt{\frac{1}{16}(x+7)} + 3$

$\boxed{y = \frac{1}{4}\sqrt{x+7} + 3}$

- compress by 1/4
- left 7 units
- up 3 units

Bookwork: page 418- Describe the transformations only on #17-20, then do #21-23, #33, 35, 36, 45, 46, 49, 52, 60