

Radical Expressions and Functions

Square Roots

What are all of the square roots of 25? _____

The _____ of 25 is written $\sqrt{25}$, and is _____ by definition.

Ex 1.

$$\sqrt{64 + 36} = \quad \quad \quad -\sqrt{\frac{9}{49}} =$$

$$\sqrt{64} + \sqrt{36} = \quad \quad \quad \sqrt{-4}$$

Cube Roots

$\sqrt[3]{8}$ (“the **cube root** of 8”) means the # whose cube is 8.

So, $\sqrt[3]{8} = \square$ since $(\square)^3 = 8$.

Ex 2.

$$\sqrt[3]{-8} = \quad \quad \quad \sqrt[3]{-125} =$$

Cube roots

- $\sqrt[3]{1} = 1$
- $\sqrt[3]{8} = 2$
- $\sqrt[3]{27} = 3$
- $\sqrt[3]{64} = 4$
- $\sqrt[3]{125} = 5$
- $\sqrt[3]{216} = 6$
- $\sqrt[3]{1000} = 10$

Even and Odd *n*th Roots

$\sqrt[5]{32} = \square$ since $(\square)^5 = 32$

$\sqrt[n]{a}$ is read “the ***n*th root** of *a*”

Ex 3.

$$\sqrt[4]{16} = \quad \quad \quad -\sqrt[4]{16} =$$

$$\sqrt[4]{-16} \quad \quad \quad \sqrt[5]{-243} =$$

$$\sqrt[7]{-1} =$$

Fourth roots

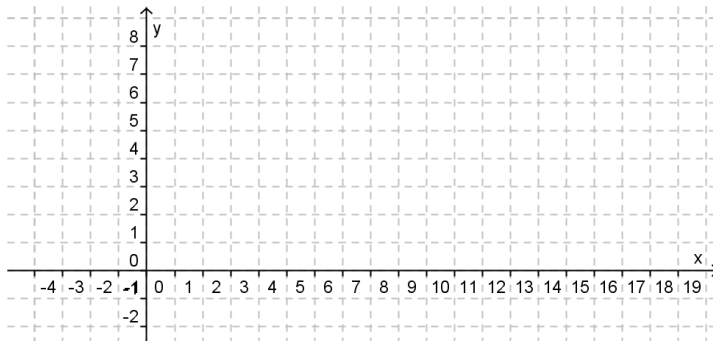
- $\sqrt[4]{1} = 1$
- $\sqrt[4]{16} = 2$
- $\sqrt[4]{81} = 3$
- $\sqrt[4]{256} = 4$
- $\sqrt[4]{625} = 5$
- $\sqrt[4]{10000} = 10$

Fifth roots

- $\sqrt[5]{1} = 1$
- $\sqrt[5]{32} = 2$
- $\sqrt[5]{243} = 3$

Root Functions

Let’s graph the **square root function** $f(x) = \sqrt{x}$



What is the domain of \sqrt{x} ? _____

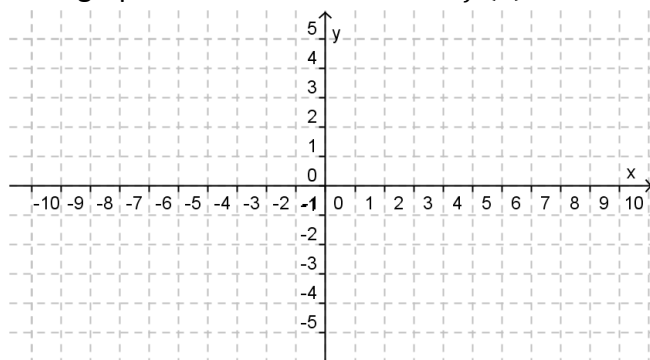
Ex 4.

Let $g(x) = \sqrt{9 - 3x}$ and find $g(-5)$ and $g(4)$.

Ex 5.

What is the domain of $f(x) = \sqrt{9 - 3x}$?

Let's graph the **cube root function** $f(x) = \sqrt[3]{x}$.



What is the domain of $\sqrt[3]{x}$? _____

Simplifying $\sqrt{a^2}$ and $\sqrt[n]{a^n}$

Note that: $\sqrt{4^2} = \sqrt{16} = 4$, and also $\sqrt{(-4)^2} = \sqrt{16} = 4$. In general, $\sqrt{a^2} =$ _____

Ex 6.

Simplify:

$$\sqrt{(2x + 5)^2}$$

$$\sqrt{25x^6}$$

$$\sqrt{x^2 - 6x + 9}$$

In general, when n is **even**, $\sqrt[n]{a^n} =$ _____

...and when n is **odd**, $\sqrt[n]{a^n} =$ _____

Ex 7.

Simplify:

$$\sqrt[3]{-27x^3}$$

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

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

$$\sqrt[6]{(-8)^6}$$

Practice

1. Evaluate each expression.

$$-\sqrt{\frac{4}{25}}$$

$$\sqrt{-64}$$

$$\sqrt{0.64}$$

$$-\sqrt{0.04}$$

$$\sqrt[3]{-64}$$

$$\sqrt{144 + 25}$$

$$\sqrt[3]{\frac{-8}{125}}$$

$$\sqrt[4]{81}$$

$$\sqrt[4]{-81}$$

$$\sqrt[9]{-1}$$

$$-\sqrt[4]{10,000}$$

2. Let $f(x) = -\sqrt{2x + 1}$ and find $f(4)$, $f(1)$, and $f(-1)$. Also, what is the domain of f ?

3. Simplify:

$$\sqrt{81x^4}$$

$$\sqrt{x^2 + 14x + 49}$$

$$\sqrt[3]{-125x^3}$$

$$\sqrt[6]{(-6)^6}$$

$$\sqrt[4]{(x + 5)^4}$$

$$\sqrt[9]{(x + 5)^9}$$

$$\sqrt[5]{-32(x - 2)^5}$$

4. Try this question... what's the domain of $f(x) = \frac{\sqrt{x-2}}{\sqrt{7-x}}$?

Q: What question can someone ask all day long, always get completely different answers, and yet all the answers could be correct?

