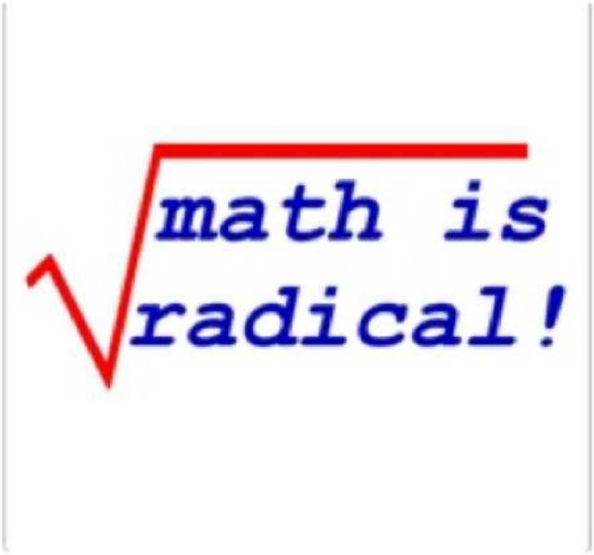
3.1 Evaluate nth Roots and Use Rational Exponents
3.2 Apply Properties of Rational Exponents



HW:

ex: Fill in the Chart...FAST!

x	x^2	x^3	x^4	x^5	x^6
1	1	1	1	1	1
2	4	8	16	32	64
3	9	27	81	243	-----
4	16	64	256	-----	-----
5	25	125	625	-----	-----
6	36	216	1296	----------	----------

nth Roots

$$\sqrt[n]{a}$$

Where:

- a is called the radicand
- n is called the index

*Square Roots: $\sqrt{a}$, $n =$ 2

Domain of nth Roots

$$\sqrt[n]{a}$$

If:

- n is even: $[0, \infty)$
- n is odd: $(-\infty, \infty)$

$\sqrt[3]{-8}$

-2

$\sqrt[4]{-16}$

nonreal

ex: Evaluate. If no real value exists, write "nonreal."

a) $\sqrt{25} = 5$

b) $\sqrt[3]{8} = 2$

c) $\sqrt[3]{-125} = -5$

ex: Evaluate. If no real value exists, write "nonreal."

d) $\sqrt[5]{243}$ = 3

e) $\sqrt[4]{-16}$ nonreal $\sqrt{-16}$ $4i$

f) $\sqrt{\frac{1}{9}}$ = $\frac{1}{3}$

ex: Evaluate. If no real value exists, write "nonreal."

g) $\sqrt[5]{32}$ $= 2$

h) $\sqrt[3]{\frac{125}{8}}$ $= \frac{5}{2}$

i) $-5\sqrt[4]{16}$ $= -10$

$-5 \cdot 2$

ex: Evaluate. If no real value exists, write "nonreal."

j) $\sqrt[17]{1} = 1$

k) $\sqrt{27} = 3\sqrt{3}$

l) $\sqrt[4]{162} = \sqrt[4]{81} \cdot \sqrt[4]{2}$

$= 3\sqrt[4]{2}$

ex: Evaluate. If no real value exists, write "nonreal."

l, n, o

m) $\sqrt[5]{-96}$

$-\sqrt[5]{96} = -\sqrt[5]{32}\cdot\sqrt[5]{3}$

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

n) $\sqrt[3]{32} = \sqrt[3]{8}\cdot\sqrt[3]{4}$

$= 2\sqrt[3]{4}$

o) $\sqrt[6]{-64}$ nonreal

ex: Rationalize.

a) $\frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

b) $\frac{2}{\sqrt[3]{3}} \cdot \frac{\sqrt[3]{9}}{\sqrt[3]{9}} = \frac{2\sqrt[3]{9}}{3}$

$\sqrt[3]{27}$

ex: Rationalize.

c) $\frac{1}{\sqrt[4]{2}} \cdot \frac{\sqrt[4]{8}}{\sqrt[4]{8}} = \frac{\sqrt[4]{8}}{2}$

$\sqrt[4]{16} = 2$

d) $\frac{5}{\sqrt[3]{9}} \quad \frac{\sqrt[3]{3}}{\sqrt[3]{3}} = \frac{5\sqrt[3]{3}}{3}$

$\frac{5}{\sqrt[3]{9}} \cdot \frac{\sqrt[3]{81}}{\sqrt[3]{81}} = \frac{5\sqrt[3]{81}}{9} = \frac{5 \cdot 3\sqrt[3]{3}}{9} = \frac{5\sqrt[3]{3}}{3}$

ex: Rationalize.

e) $\frac{7}{\sqrt[6]{8}} \cdot \frac{\sqrt[6]{8}}{\sqrt[6]{8}} = \frac{7\sqrt[6]{8}}{2}$

$\sqrt[6]{64}$

f) $\frac{15}{\sqrt[5]{25}} \cdot \frac{\sqrt[5]{125}}{\sqrt[5]{125}} = \frac{15\sqrt[5]{125}}{5}$

$= 3\sqrt[5]{125}$

g) ~~$\frac{-8}{\sqrt[10]{16}}$~~

Operations with nth Roots

- Addition/Subtraction - the radicals must be "like radicals"

ex: Perform the indicated operation.

a) $7\sqrt[5]{8} + \sqrt[5]{8}$

b) $4\sqrt[3]{2} - 6\sqrt[5]{2}$

ex: Perform the indicated operation.

c) $\sqrt[4]{2} - \sqrt[3]{2}$

d) $\sqrt[3]{54} - \sqrt[3]{2}$

Operations with nth Roots

- Multiplication/Division - the radicals must have the same index

ex: Perform the indicated operation.

a) $\dfrac{\sqrt[3]{250}}{\sqrt[3]{2}}$

ex: Perform the indicated operation.

b) $\dfrac{\sqrt[4]{4}}{\sqrt[4]{36}}$

Rational Exponents

$$x^{\frac{e}{i}} = \_\_\_\_\_$$

Where:

- e is called the _____

- i is called the _____

ex: Rewrite in radical form.

a) $4^{3/5}$

b) $27^{4/3}$

c) $9^{5/2}$

ex: Rewrite in radical form.

d) $-4^{1/2}$

e) $(-3)^{5/3}$

f) $2 \cdot 7^{3/4}$

ex: Rewrite in exponential form.

a) $\sqrt[7]{21}$

b) $\sqrt{8^3}$

c) $-\sqrt[3]{-9}$

ex: Evaluate. If no real value exists, write "nonreal."

a) $9^{3/2}$

b) $81^{3/4}$

c) $4^{5/2}$

ex: Evaluate. If no real value exists, write "nonreal."

d) $8^{4/3}$

e) $1000^{2/3}$

f) $32^{3/5}$

ex: Evaluate. If no real value exists, write "nonreal."

g) $(-216)^{2/3}$

h) $16^{-3/4}$

i) $-4^{3/2}$

ex: Evaluate. If no real value exists, write "nonreal."

j) $-216^{-2/3}$

k) $2 \cdot 32^{3/5}$

l) $64^{1/12} \cdot 64^{1/4}$

ex: Evaluate. If no real value exists, write "nonreal."

m) $\left(\frac{27}{8}\right)^{-4/3}$

n) $\frac{27^{-4/3}}{8}$

o) $(-9)^{5/2}$

p) $-(-8)^{-4/3}$

ex: Between which two consecutive integers does the expression lie?

a) $\sqrt{10}$

b) $\sqrt[5]{40}$

ex: Between which two consecutive integers does the expression lie?

c) $\sqrt[3]{-7}$

d) $\sqrt[4]{5}$

e) $4^{3/4}$

ex: Evaluate on your calculator.

a) $\sqrt[5]{40}$

b) $\sqrt[3]{-7}$

c) $4^{3/4}$