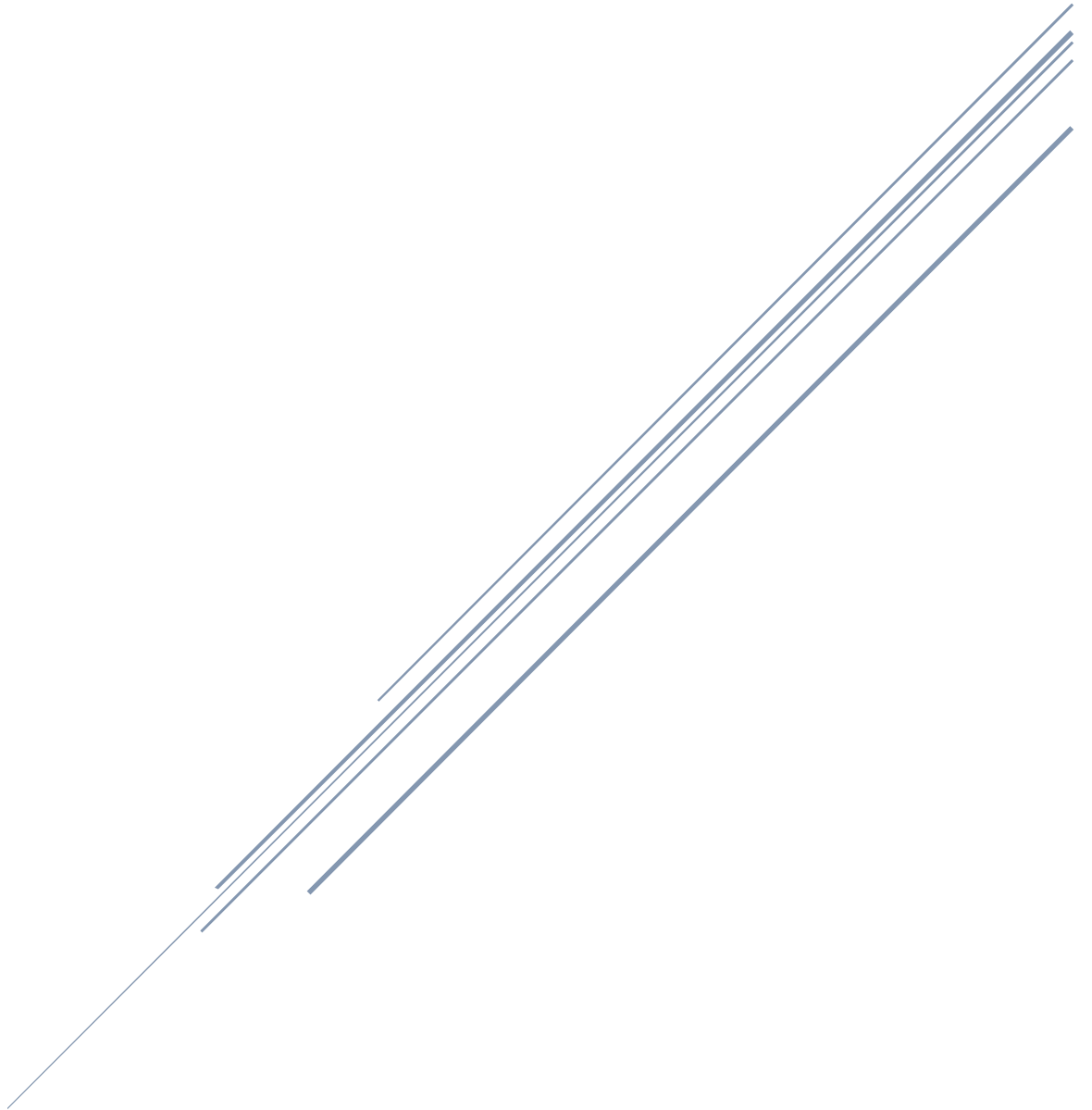


Chapter 3 Notes
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Sections and videos:

Section 3.1 playlist:

<https://www.youtube.com/playlist?list=PLDP6hC4Qvja1Tlu1aqif9htmRzTHFMo60>

Section 3.2 playlist:

<https://www.youtube.com/playlist?list=PLDP6hC4Qvja3ajWXEC7Rt9asq2CT1YFSv>

Sections 3.3 and 3.4 playlist:

https://www.youtube.com/playlist?list=PLDP6hC4Qvja3e9wNV_-tnc2OwBcEir-PO

Sections 3.5 and 3.6 playlist:

<https://www.youtube.com/playlist?list=PLDP6hC4Qvja2zQscUkhtd4AXBWliLAGc7>

Section 3.7 playlist:

<https://www.youtube.com/playlist?list=PLDP6hC4Qvja1gTULGy-VCOesrzhwNa01A>

Section 3.2. Rational Exponents

1. If x is a real number and n is a positive integer greater than 1, then:

a) $\sqrt{x^2} = \underline{\hspace{2cm}}$.

b) $\sqrt[3]{x^3} = \underline{\hspace{2cm}}$.

c) $\sqrt[4]{x^4} = \underline{\hspace{2cm}}$.

d) $\sqrt[5]{x^5} = \underline{\hspace{2cm}}$.

e) $\sqrt[n]{x^n} = \underline{\hspace{2cm}}$ if n is even or $\underline{\hspace{2cm}}$ if n is odd.

2. Evaluate each of the following roots without using a calculator.

a) $\sqrt[3]{8}$

b) $\sqrt[3]{-8}$

c) $-\sqrt[3]{-8}$

d) $\sqrt[4]{16}$

e) $\sqrt[5]{-32}$

f) $\sqrt[3]{-\frac{27}{125}}$

g) $\sqrt[4]{-\frac{81}{256}}$

h) $\sqrt{-64}$

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

3. Simplify the following expressions. For e through l, assume all variables are positive.

a) $\sqrt{b^2}$

b) $\sqrt[4]{a^4}$

c) $\sqrt{x^4}$

d) $\sqrt{25m^{24}n^6}$

e) $\sqrt{16x^{16}}$

f) $-5a\sqrt{49a^8b^4c^2}$

g) $\sqrt{\frac{64x^9}{4x^3}}$

h) $-\sqrt[3]{\frac{8h}{1000h^7}}$

i) $\sqrt[3]{64x^3y^6}$

j) $\sqrt[4]{625p^{24}q^{12}}$

k) $\sqrt[5]{32a^{10}b^{35}}$

l) $\sqrt[3]{(a+b)^3}$

Patterns:

Conclusion:

Definition of a Rational Exponent

- A rational exponent is of the form: $x^{\frac{a}{b}}$ where $b \neq 0$, where x is a real number and a, b are integers and b is positive.
- _____ is the same as _____
- For example: $9^{\frac{1}{2}} = \text{_____} = \text{_____}$
- $x^{\frac{a}{b}}$ could be rewritten as : _____ which is the same as _____
- For example: $8^{\frac{2}{3}} = \text{_____}$

Rewriting radicals as rational exponents

4. Rewrite each radical expression as an exponential expression.

a) $\sqrt{7}$

b) $\sqrt[4]{6}$

c) $\sqrt[3]{x^5}$

d) $\sqrt{x^3y^7z}$

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

Rewriting rational exponents as radical expressions

5. Rewrite each exponential expression as its equivalent radical expression.

a) $9^{\frac{6}{11}}$

b) $(x^3 + y)^{\frac{1}{5}}$

c) $5c^{-\frac{2}{3}}d^{\frac{8}{5}}$

d) $(r^{\frac{2}{7}})^3$

e) $(5 + 3e^6)^{-\frac{1}{4}}$

6. Use the definition of the rational exponents to write expressions with radicals. Then, simplify them.

a) $49^{1/2}$

b) $64^{1/3}$

c) $81^{1/4}$

d) $-144^{1/2}$

e) $\left(\frac{169}{9}\right)^{0.5}$

f) $\left(\frac{625}{81}\right)^{1/4}$

g) $\left(\frac{1}{8}\right)^{-1/3}$

h) $(-243)^{-1/5}$

Dr. L tip time:

Assume all variables represent positive real numbers.

7. Evaluate each of the following without using a calculator.

a) $49^{3/2}$

b) $64^{2/3}$

c) $81^{3/2}$

d) $(-27x^9y^{-15})^{-\frac{4}{3}}$

e) $(32n^{-10})^{-\frac{2}{5}}$

f) $\left(\frac{27x^{-9}}{125y^6}\right)^{-2/3}$

g) $25^{1/2} + 27^{2/3}$

h) $\frac{1^{2/3}}{8} + \frac{1^{1/2}}{4}$

i) $(64x^6)^{(-1/3)} + (49x^4)^{(-1/2)}$

8. Use the properties of exponents to simplify each of the following as much as possible.

a) $x^{3/7} \cdot x^{2/7}$

b) $(b^{5/4})^{-12/5}$

c) $\frac{p^{5/6}}{p^{1/2}}$

d) $(-216a^9)^{(-1/3)}$

e) $\frac{(m^{-1/2}n^{-3})^8}{m^2n^{3/2}}$

9. Write the expression as a single radical:

a) $\sqrt{\sqrt[4]{a}}$

b) $\sqrt[5]{\sqrt[3]{n^2}}$

10. Multiply. $3x^{4/5}y^{1/3}(4x^{6/5}y^{-1/3} - 12x^{-4/5}y^{5/3})$

11. Multiply. $(x^{1/2} - y^{1/2})(x^{1/2} + y^{1/2})$

12. Factor the following:

a) $x^{2/5} - 5x^{1/5} + 6$

b) $4x^{4/9} + 12x^{2/9} - 7$

c) $25x^{2/11} - 49$

d) $4x^{2/7} + 12x^{1/7} + 9$