

Unit 2

Exponential Functions

SOURCE

2 video lessons

SOURCE LOCK

Source-locked summary: translated and condensed only from Lessons 7-8 distilled video notes.

No added practice problems or outside examples are included.

Every section below carries a lesson/source label.

Roots and rational exponents

L07 sections 1-3

- An n th root solves $x^n=a$.
- Odd roots keep the sign. Even roots of positive numbers come in opposite pairs.
- Negative numbers have no real even root.
- n th root of a^n becomes a for odd n , and $|a|$ for even n .
- $a^{m/n}$ is the n th root of a^m , under the stated positive-base condition.

Exponent laws

L07 section 4

- Same base multiplication adds exponents.
- Same base division subtracts exponents.
- A power of a power multiplies exponents.
- Products inside a power can be split when the base conditions are satisfied.
- A nonzero number to the 0 power equals 1.

Algebra with $x + 1/x$

L08 section 1

- If $S=x+1/x$, then $x^2+1/x^2=S^2-2$.
- Also $x^3+1/x^3=S^3-3S$.
- When $x+1/x=3$, $x^2+1/x^2=7$.
- For x^2-1/x^2 , keep the plus-or-minus sign unless the problem fixes it.

Exponential function properties

L08 sections 3-6

- The basic form is $y=a^x$ with $a>0$ and a not equal to 1.
- Domain is all real numbers. Range is $(0,+\infty)$.
- The graph always passes through $(0,1)$.
- If $a>1$, the function increases. If $0<a<1$, it decreases.
- $y=a^x$ and $y=(1/a)^x$ are symmetric about the y -axis.

teacher tips from class

ONE LANGUAGE FOR POWERS · L07

Convert radicals into rational exponents before combining expressions.

After that, use exponent laws instead of juggling roots by eye.

EVEN ROOTS NEED ABSOLUTE VALUE · L07

When the root index is even, n th root of a^n gives $|a|$.

This is where many sign mistakes enter.

KEEP THE PLUS-OR-MINUS · L08

If a square only tells you $(x-1/x)^2$, do not choose a sign too early.

Keep +/- until the problem determines the sign.

BASE SIDE OF 1 · L08

When comparing exponential values, first decide whether the base is above 1 or between 0 and 1.

Then use increasing/decreasing behavior.

ZERO-POWER CONDITIONS · L08

A nonzero base to the 0 power equals 1.

Zero to a nonpositive power is not meaningful.

ANCHOR EVERY EXPONENTIAL GRAPH · L08

All basic exponential graphs pass through (0,1).
In Quadrant I, the larger base rises faster.

REWRITE THE HIDDEN BASE · L08

For b^{ax} , rewrite it as $(b^a)^x$ first.
The new base b^a decides whether the graph increases or decreases.

GROWTH IS MULTIPLICATIVE · L08

Continuous percentage growth uses a multiplication model.
Do not treat each period as adding the same amount.

APPROXIMATION HAS A JOB · L08

Use the first-order approximation only for quick estimates.
Return to the original exponential expression for exact results.

video example

L07 example

PROBLEM

Simplify fourth root of $(3-\pi)^4$

Step 1: The root index is even.

Step 2: Use absolute value: fourth root of $(3-\pi)^4 = |3-\pi|$.

Step 3: Since $\pi > 3$, the value is $\pi - 3$.

video example

L08 example

PROBLEM

If $y = a^x$ passes through $(3, \pi)$

Step 1: Substitute the point: $a^3 = \pi$.

Step 2: So $a = \pi^{1/3}$.

Step 3: Then $f(x) = \pi^{x/3}$.