

Lesson 3.1 - Exponential & Logistic Functions

OBJECTIVE

Evaluate exponential expressions and identify and graph exponential and logistic functions.

VOCABULARY

- Base
- Exponential function
- Growth/decay factor
- Logistic function
- Natural exponential function
- Natural base

KNOWLEDGE

- Exponential functions & their graphs
- Exponential growth & decay models
- The natural exponential function: $f(x) = e^x$
- The Natural Base e
- Logistic functions & their graphs
- Logistic growth & decay functions

SKILLS

- Identify exponential functions; state the initial value and base
- Find the exact value of an exponential function (N – RN.1 & 2 & A – SSE.3c)
- Find the equation of an exponential functions (F – LE.2)
- Describe the transformations made to the graph of an exponential function (F – BF.3)
- Determine whether a function is an exponential growth OR decay function (F – IF.8b & F – LE.1)
- Analyze properties of and graph exponential and logistic functions (F – IF. 4 & F – IF.7e)
- Set up and solve applications of exponential functions (A – CED.1 & F – IF.5 & 8b)

Lesson 3.2 - Exponential & Logistic Modeling

OBJECTIVE

Use exponential growth, decay and regression to model real-life problems.

VOCABULARY

- Constant percentage rate
- Maximum sustainable population

KNOWLEDGE

- Exponential Population Model
- Exponential Growth vs. Exponential Decay
- Exponential vs. Logistic models

SKILLS

- Find an exponential (or a logistic) function (F – LE.2)
- Use regression to model population (S – ID.6a)
- Model w/exponential & logistic functions: populations, bacteria growth, radioactive decay (A – CED.1, F – IF.5 & 8b & F – LE.4)

Lesson 3.3 - Logarithmic Functions & Their Graphs

OBJECTIVE

Convert equations between logarithmic form and exponential form; evaluate common and natural logarithms; and graph common and natural logarithmic functions

VOCABULARY

- Common logarithms
- Logarithmic function w/base b
- Natural logarithms

KNOWLEDGE

- Logarithmic vs. exponential form
- “a logarithm is an exponent”
- The basic properties of logarithms
- The basic properties of common logarithms
- The basic properties of natural logarithms

SKILLS

- Convert between logarithmic and exponential form (F – BF.5)
- Evaluate logarithmic, exponential and natural logarithmic expressions (N – RN.1 & 2 & A – SSE.3c)
- Solve logarithmic equations (F – BF.5)
- Describe how to transform the graphs of $y = \ln x$ and $y = \log x$ (F – BF.3)
- Analyze properties of and graph logarithmic functions (F – IF. 4 & F – IF.7e)
- Model with logarithmic functions (A – CED.1, F – IF.5 & 8b & F – LE.4)

Lesson 3.4 - Properties of Logarithmic Functions

OBJECTIVE

Apply the properties of logarithms to evaluate expressions and graph functions.

KNOWLEDGE

- The Properties of Logarithms
- Change of Base Formula for Logarithms

SKILLS

- Use the properties of logarithms to expand a single logarithm and to condense an expression into a single logarithm (A – SSE.2)
- Use the change-of-base formula to evaluate logarithms (A – SSE.3c)
- Express common logarithms as natural logarithms (and vice versa)
- Describe how to transform the graph of a logarithmic function (F – BF.3)
- Analyze properties of and graph logarithmic functions (F – IF. 4 & F – IF.7e)

Lesson 3.5 - Equation Solving & Modeling

OBJECTIVE

Apply the properties of logarithms (and exponents) to solve exponential and logarithmic equations algebraically and solve application problems using these equations

VOCABULARY

- Order of magnitude

KNOWLEDGE

- Properties of Exponents & Logarithms
- One-to-One Properties
- Newton's Law of Cooling

SKILLS

- Solve exponential & logarithmic equations algebraically (and graphically) (A – SSE.3, A – REI.11, F – BF.5)
- Solve application problems using logarithms (A – CED.1, F – IF.5 & 8b & F – LE.4)

Lesson 3.6 - Mathematics of Finance

OBJECTIVE

Use exponential functions and equations to solve business and finance applications related to compound interest and annuities

VOCABULARY

- Compound interest
- Compounded continuously
- Annual percentage yield (APY)
- Annuity
- Future value
- Present value
- Annual percentage rate (APR)

KNOWLEDGE

- Interest compounded annually, k times per year; continuously
- Future value of an annuity
- Present value of an annuity

SKILLS

- Find the amount after interesting a principal for t years at an interest rate compounded: annually, k times per year, continuously
- Find the future value in an annuity
- Find the present value of a loan; find the periodic payment of a loan
- Determine length of time; interest rate; APY
- Solve application problems involving interest, investments, annuities, loans and mortgages (A – CED.1 & 4, F – IF.5 & 8b & F – LE.4)