Exponential Growth And Decay Worksheet Answer Key PDF

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Part 1: Building a Foundation

Which of the following is the base of the natural logarithm used in exponential growth and decay formulas?

undefined. A) 2

undefined. B) 3.14

undefined. C) 2.718 ✓

undefined. D) 10

The base of the natural logarithm is approximately 2.718.

Which of the following are components of the exponential growth formula N(t) = N_0 × e^{kt}?

undefined. A) Initial quantity (N_0) ✓

undefined. B) Growth rate constant (k) ✓

undefined. C) Time (t) ✓

undefined. D) Base of the natural logarithm (e) ✓

The components include the initial quantity, growth rate constant, time, and the base of the natural logarithm.

Explain in your own words what exponential decay means and provide a real-world example.

Exponential decay refers to a process where a quantity decreases at a rate proportional to its current value, such as radioactive decay.

List the formulas for: Exponential Growth, Exponential Decay.

1. Exponential Growth

N(t) = N_0 × e^{kt}

2. Exponential Decay

N(t) = N_0 × e^{-kt}

Exponential Growth: N(t) = N_0 × e^{kt}; Exponential Decay: N(t) = N_0 × e^{-kt}.

Part 2: comprehension and Application

What does the growth rate constant (k) determine in an exponential growth scenario?

undefined. A) The initial quantity

undefined. B) The speed of growth ✓

undefined. C) The time it takes to reach half the initial value

undefined. D) The final quantity

The growth rate constant (k) determines the speed of growth in an exponential growth scenario.

Which of the following scenarios can be modeled using exponential decay?

undefined. A) Population growth in a city

undefined. B) Radioactive decay of a substance ✓

undefined. C) Cooling of a hot object ✓

undefined. D) Accumulation of interest in a bank account

Scenarios that can be modeled using exponential decay include radioactive decay and cooling of a hot object.

Calculate the amount of a radioactive substance remaining after 10 years if its half-life is 5 years and the initial amount is 100 grams.

After 10 years, which is two half-lives, 25 grams of the substance will remain.

If a population of bacteria doubles every 3 hours, what is the doubling time in terms of the growth rate constant (k)?

undefined. A) ln(2)/3 ✓

undefined. B) 3 × ln(2)

undefined. C) 3/ln(2)

undefined. D) ln(3)

The doubling time in terms of the growth rate constant (k) is given by the formula k = ln(2)/3.

Part 3: Analysis, Evaluation, and Creation

What is the relationship between the doubling time and the growth rate constant in exponential growth?

undefined. A) Directly proportional

undefined. B) Inversely proportional ✓

undefined. C) No relationship

undefined. D) Equal

The relationship is inversely proportional; as one increases, the other decreases.

Analyze the following scenarios and identify which involve exponential growth:

undefined. A) A car depreciating in value

undefined. B) A virus spreading in a population ✓

undefined. C) A plant growing in height ✓

undefined. D) Water evaporating from a pond

The scenarios involving exponential growth include a virus spreading in a population and a plant growing in height.

Compare and contrast exponential growth and decay, highlighting their key differences and similarities.

Exponential growth increases over time, while exponential decay decreases; both can be modeled mathematically.

Which factor is most critical in determining whether a process is modeled by exponential growth or decay?

undefined. A) Initial quantity

undefined. B) Rate constant sign ✓

undefined. C) Time period

undefined. D) Base of the natural logarithm

The rate constant sign is the most critical factor; a positive sign indicates growth, while a negative sign indicates decay.

Design a real-world scenario where exponential growth or decay could be applied. Describe the situation, identify the variables involved, and explain how you would model it mathematically.

A scenario could involve population growth or the decay of a radioactive substance, modeled using the respective formulas.