

# Exponential Functions Test With Answers

Exponential Functions Test With Answers Exponential Functions Test with Answers This test covers various aspects of exponential functions ranging from basic definitions to more complex applications It is designed for students taking an Algebra II or Precalculus course I Multiple Choice 2 points each 20 points total 1 Definition of Exponential Function Which of the following is the general form of an exponential function a  $f(x) = ax + b$  b  $f(x) = ax \cdot bx$  c  $f(x) = abx$  d  $f(x) = ax$  Answer c  $f(x) = abx$  2 Identifying Exponential Functions Which of the following is an exponential function a  $y = 2x + 1$  b  $y = 3x$  c  $y = x^2$  d  $y = x$  Answer b  $y = 3x$  3 Growth/Decay If the base of an exponential function is greater than 1 the function represents a Exponential growth b Exponential decay c Linear growth d Linear decay Answer a Exponential growth 4 Graphing Exponential Functions The graph of the exponential function  $f(x) = 2x$  passes through which point a  $(0, 0)$  b  $(1, 1)$  c  $(1, 2)$  d  $(2, 1)$  Answer c  $(1, 2)$  5 Transformations The graph of  $y = 2x + 3$  is a translation of the graph of  $y = 2x$  a 3 units to the right b 3 units to the left c 3 units up d 3 units down Answer a 3 units to the right 6 Solving Exponential Equations What is the solution to the equation  $4x = 16$  a  $x = 2$  b  $x = 4$  c  $x = 8$  d  $x = 16$  Answer a  $x = 2$  7 Logarithmic Form The logarithmic form of the exponential equation  $5^3 = 125$  is a  $\log 125 = 3$  b  $\log 125 = 5$  c  $\log 5 = 3$  d  $\log 3 = 5$  Answer a  $\log 125 = 3$  8 Evaluating Logarithms What is the value of  $\log_8 8$  a 2 b 3 c 4 d 8 Answer b 3 9 Properties of Logarithms Which of the following is NOT a property of logarithms a  $\log b = \log b$  b  $\log c = \log b \cdot \log c$  c  $\log b = \log bc$  d  $\log b = \log c$  if and only if  $b = c$  Answer b  $\log c = \log b \cdot \log c$  if and only if  $b = c$  10 Solving Logarithmic Equations What is the solution to the equation  $\log_x x = 2$  a  $x = 1$  b  $x = 7$  c  $x = 9$  d  $x = 11$  Answer b  $x = 7$  II Short Answer 3 points each 15 points total 1 Writing Exponential Equations Write the exponential function that represents the growth of a population that doubles every 5 years starting with an initial population of 1000 2 Graphing Exponential Functions Sketch the graph of the function  $f(x) = 12x$  Label at least two points on the graph 3 Solving Exponential Equations Solve the equation  $5x = 125$  4 Solving Logarithmic Equations Solve the equation  $\log x = 3$  4 5 Applications The value of a car depreciates exponentially If the initial value was 25000 and it depreciates at a rate of 10 per year what will be the car's value after 5 years III Problem Solving 5 points each 25 points total 1 Compound Interest If 1000 is invested at an annual interest rate of 5 compounded monthly how much money will be in the account after 10 years 2 Population Growth The population of a town is growing exponentially If the population was 10000 in 2000 and 15000 in 2010 what will be the population in 2020 4 3 Radioactive Decay The half-life of a radioactive substance is 10 years If you start with 100 grams of the substance how much will be left after 30 years 4 Solving Exponential Inequalities Solve the inequality  $3x > 9$  5 Logarithmic Transformation The intensity of sound is measured in decibels (dB) The formula for the intensity level in decibels is given

by  $L = 10 \log \frac{I}{I_0}$  where  $I$  is the intensity of the sound and  $I_0$  is the reference intensity. If the intensity of a sound increases by a factor of 10, by how many decibels does the intensity level increase?

**IV Bonus 5 points** Prove the following logarithmic property:  $\log_b bc = \log_b b + \log_b c$

**Answer Key** This answer key provides solutions and explanations for each problem. It allows students to check their work and understand the concepts tested.

**I Multiple Choice**

- $c = \frac{f}{ax}$  This is the general form of an exponential function where  $a$  is the initial value and  $b$  is the base.
- $y = 3^x$  This function has a variable in the exponent, which is the defining characteristic of exponential functions.
- a Exponential growth** When the base is greater than 1, the function grows rapidly as  $x$  increases.
- $c = 12$  Substituting  $x = 1$  into the function  $f(x) = 2^x$  gives us  $f(1) = 2^1 = 2$ , a 3 units to the right. The term  $x = 3$  inside the exponent shifts the graph 3 units to the right.
- $a = x^2$  Since  $4 = 16 = 2^4$ ,  $a = \log_2 16 = 4$ .
- $\log_3 125 = 3$  This is the logarithmic form of the exponential equation  $8 = b^3$ . Since  $2 = 8 = 2^3$ ,  $d = \log_2 b = \log_2 8 = 3$  if and only if  $b = c$ . This statement is not true as  $\log_b b = \log_b c$  if and only if  $bc = 1$ .
- $10 = b \times 7$  Solving for  $x$  in the equation  $\log_x x = 2^2$  gives us  $x = 7$ .

**II Short Answer**

- $1 \text{ ft} = 1000 \text{ ft} = 2^{10}$  The population doubles every 5 years, so the base is 2 and the exponent is  $t/5 = 2$ .
- Sketch** The graph will pass through the points  $(0, 1)$  and  $(1, 12)$ . It will have a horizontal asymptote at  $y = 0$ .
- $3 = x^1 = 25$  Solving the equation  $5x = 125$  gives us  $x = 12.4$ .
- $x = 19$  Solving the equation  $\log_x x = 3 = 4$  gives us  $x = 3^{24} = 5$ .
- Value** 15000. The formula for exponential decay is  $V_t = V_0 e^{-rt}$ .

**III Problem Solving**

- A** 164701. Using the compound interest formula  $A = P(1 + r/n)^{nt}$ .
- Population** 22500. Using the exponential growth formula  $P_t = P_0 e^{kt}$ .
- Amount** 125 grams. Using the formula for radioactive decay  $N_t = N_0 2^{-t/T}$ .
- $x = 2$  Solving the inequality  $3x = 9$  gives us  $x = 12 = 5$ .

**Intensity level increases by 10 dB**. The intensity level increases by 10 dB for every factor of 10 increase in intensity.

**IV Bonus Proof** Let  $y = \log_b bc$ . Then  $ay = bc$ . Multiply both sides by  $c$ :  $ay = c^2 b$ . Take the logarithm base  $a$  of both sides:  $\log_a ay = \log_a c^2 b$ . Using the property  $\log_b b = c \log_b \log_c \log_a y = \log_a \log_c \log_b$ . Since  $\log_a ay = y \log_a c = \log_b$ . Therefore  $y \log_b \log_c$ . Since  $y = \log_b bc$ , we have proven that  $\log_b bc = \log_b b + \log_b c$ . This comprehensive test provides a thorough assessment of students' understanding of exponential functions, their properties, and various applications. The inclusion of answers and detailed explanations fosters self-learning and reinforces key concepts.

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