

Name: _____ Date: _____ Band: _____
Algebra 2

Exponential and Logarithmic Functions Performance Task

Instructions: Choose **one** performance task. Write all your work on a separate clean piece of paper and attach it to this page.

Big Idea: Modeling

You can represent many real-world mathematical problems algebraically. An algebraic model can lead to an algebraic solution.

Performance Task 1

Suppose you invest a dollars to earn an annual interest rate of r percent (as a decimal). After t years, the value of the investment with interest compounded yearly is $A(t) = a(1 + r)^t$. The value with interest compounded continuously is $A(t) = a \cdot e^{rt}$.

- A. Explain why you can call $e^r - 1$ the effective annual interest rate for the continuous compounding.
- B. Suppose you can earn interest at some rate between 0% and 5%. Use your knowledge of the exponential function to explain why continuous compounding does not give you much of an investment advantage.
- C. For each situation find the unknown quantity, such that continuous compounding gives you a \$1 advantage over annually compounded interest. Show your work.
 - How much must you invest for 1 year at 2%?
 - At what interest rate must you invest \$1000 for 1 year?
 - For how long must you invest \$1000 at 2%?

Big Idea: Function

You can use transformations such as translation, reflections, and dilations to understand relationships within a family of functions.

Performance Task 2

$f(x) = b^x$ and $g(x) = \log_b x$ are inverse functions. Explain why each of the following is true.

- A. The translation $f_1(x) = b^{x-h}$ of f is equivalent to a vertical stretch or shrink of f .
- B. The inverse of $f_1(x) = b^{x-h}$ is equivalent to a translation of g .
- C. The inverse of $f_1(x) = b^{x-h}$ is not equivalent to a vertical stretch or shrink of g .
- D. The function $k(x) = \log_c x$ is a vertical stretch or shrink of g or of its reflection $-g(x)$.

Performance Task Assessment: Analytic Holistic Scoring

Developing Autonomy—The student

| | |
|---|---|
| 3 | Persevered to complete the problem without help |
| 2 | Completed most of the problem without help |
| 1 | Needed key hints to complete the problem |
| 0 | Needed extensive guidance to work the problem |

The Solution Process—The student's work showed

| | |
|---|---|
| 3 | A complete and appropriate solution process |
| 2 | An appropriate solution process that is almost complete |
| 1 | An appropriate process that is partially complete |
| 0 | An inappropriate process or no evidence of a process |

The Conclusion/Answer—The student's answer is an

| | |
|---|---|
| 3 | Accurate conclusion, supported by valid evidence and reasons, appropriate to this problem and context |
| 2 | Inaccurate but logical conclusion, supported by evidence and reasoning but incorrect due to a minor factual error (in details of problem, in computation, recall a formula, etc.) or minor mistake in reasoning |
| 1 | Inaccurate but logical conclusion that overlooks, or gets wrong significant facts (about the problem, the rule, computation, etc.) |
| 0 | Inappropriate conclusion: not supported by facts and logic, or there is no conclusion |

Teacher Comments: