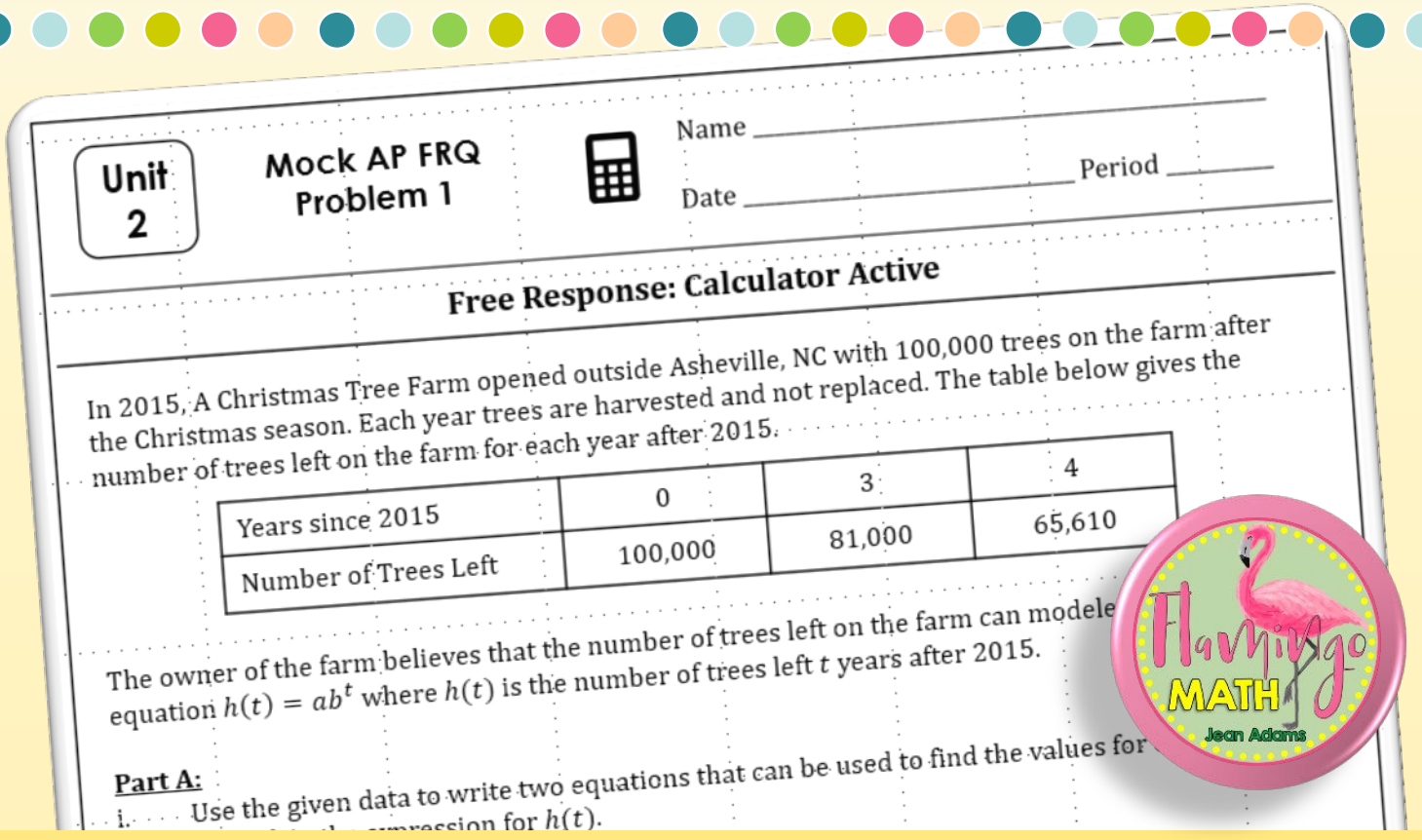
AP® Precalculus

Exponential and Logarithmic Functions



Unit 2

Mock AP FRQ
Problem 1

Name _____

Date _____ Period _____

Free Response: Calculator Active

In 2015, A Christmas Tree Farm opened outside Asheville, NC with 100,000 trees on the farm after the Christmas season. Each year trees are harvested and not replaced. The table below gives the number of trees left on the farm for each year after 2015.

Years since 2015	0	3	4
Number of Trees Left	100,000	81,000	65,610

The owner of the farm believes that the number of trees left on the farm can modele
equation $h(t) = ab^t$ where $h(t)$ is the number of trees left t years after 2015.

Part A:

i. Use the given data to write two equations that can be used to find the values for
pression for $h(t)$.

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Unit 2 Mock AP Exam FRQ's

Exponential & Logarithmic Functions
Mock AP Exam FRQ's

KEY CONCEPTS/TOPICS:

This task model may include function composition, inverse functions, function input-output values, zeros of a function, end behavior of a function, and identification of an appropriate function type to construct a function model.

About The Product

AP Exam Mock FRQ's Set

This set of five free response questions is designed for AP Precalculus students to practice **Function Concepts for topics in Unit 2 for the AP Exam**

Using the problem set:

You can use the set as a review for the AP Exam after unit 2 is completed. Each FRQ is designed to be done with a calculator to model the requirements for the AP Exam.

Preparation

1. Copy an FRQ prompt for each student.
2. Have students work the problem set with a calculator or Desmos.
3. Grade on a 6-point scale, included in the key to match the AP Precalculus Exam.
4. A Calculator "Cheat Sheet" with helpful tips is also provided.

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Product Pages

www.FlamingoMath.com

Unit 2 — Mock AP FRQ Problem 1

Name _____

Date _____ Period _____

Free Response: Calculator Active

In 2015, A Christmas Tree Farm opened outside Asheville, NC with 100,000 trees on the farm after the Christmas season. Each year trees are harvested and not replaced. The table below gives the number of trees left on the farm for each year after 2015.

Years since 2015	0	3	4
Number of Trees Left	100,000	81,000	65,610

The owner of the farm believes that the number of trees left on the farm can modeled by the equation $h(t) = ab^t$ where $h(t)$ is the number of trees left t years after 2015.

Part A:

i. Use the given data to write two equations that can be used to find the values for constants a and b in the expression for $h(t)$.

ii. Find the values of a and b.

Part B:

i. Use the given data to find the average rate of change of trees left per year from 2015 to 2019. Express your answer [illegible] and interpret the [illegible]

ii. Use the average rate of change found in (i) to estimate [illegible] estimates, found using the average rate of change, be less than the actual [illegible] of h given by the model for h? Explain your reasoning.

Part C:

The owners believe that the trend in the number of trees left will continue. They do not have money to replace any harvested trees. Based on this model, what will be the number of trees left on the farm be 8? Give a reason for your answer.

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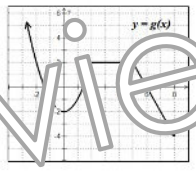
Unit 2 — Mock AP FRQ Problem 2

Name _____

Date _____ Period _____

Free Response: Calculator Active

Let figure below shows the graph of the function g on its domain of all real numbers.



The function f is defined by $f(x) = -3(2)^{x+3}$

Part A:

i. The function h is defined by $h(x) = (f \circ g) = f(g(x))$. Find the value of $h(0)$ as a decimal approximation or indicate that it is not defined.

[illegible]icate that not such values exist.

[illegible]ch that $f(x) = -48$

[illegible]havior of $f(x)$ a[illegible]decreases without bound. Express [illegible]nswer using [illegible]ation of a limit.

[illegible]rrible.

[illegible]answer based on the definition of a function and the graph of $y = g(x)$.

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Unit 2 — APPC FRQ Problem 5

Name _____

Date _____ Period _____

Free Response: Calculator Active

Students who took AP Statistics in Fall Semester wanted to see how much content from the class they retained over Spring Semester until the day of the AP Test. At the end of Fall Semester, students completed an initial test to determine the group's content knowledge. At the time ($t = 0$), the group of students achieved a score of 80 out of 100 points. From the next 120 days, the group was evaluated at the end of every 12 days. After 36 days ($t = 36$), the [illegible] was 75 points. The group's score can be modeled by the function R given by $R(t) = a + b \ln(t + 1)$ where $R(t)$ is the score, in points, for days t, and t is measured in the number of days since the initial test.

Part A:

i. Use the given data to write two equations that can be used to find the values for constants a and b in the expression for $R(t)$.

ii. [illegible] the values of a and b.

Part B:

i. Use the given data to find the average rate of change of scores, in points per day, from $t = 0$ to $t = 36$ days. Express your answer as a decimal approximation. Show the computations that lead to your answer.

ii. Interpret the meaning of your answer from (i) in context of the problem.

iii. Consider the average rates of change of R from $t = 3$ to $t = p$ days, where $p > 36$. Are the average rates of change less than or greater than the average rate of change from $t = 0$ to $t = 36$ days found in (i)? Explain your reasoning.

Part C:

The students would like to know if model R is appropriate one year after the AP test, 365 days after the initial 120 days. The students decide that R will be an appropriate model if the predicted score a year after the AP test ($t = 485$) is at least one point lower than their predicted score on the day of the AP test ($t = 120$). Based on this information, will R be an appropriate model? Give a reason for your answer.

Unit 2 — Mock AP FRQ Problem [illegible]

Name _____

Date _____

Free Response: Calculator

The domain of $n(x)$ consists of the five real numbers 1, 2, 4, 8, the function n for these values

x	1	2	4	8
$n(x)$	5	10	15	20

The function g is defined by $g(x) = 3\ln(0.75x - 9)$

Part A:

i. The function h is defined by $h(x) = (q \circ n) = q(n(x))$ approximation or indicate that it is not defined.

ii. Find $h'(20)$ or indicate that it is not defined.

Part B:

i. Find all the values [illegible] $q(x)$ [illegible] vertical asymptote, indicate if values exist.

ii. Determine the [illegible] of $q(x)$ as x increases without bound. Express your answer using mathematical notation of a limit.

Part C:

i. Determine if n is invertible.

ii. Give a reason for your answer based on the definition of a function and the graph of $y = n(x)$.

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[illegible] FRQ [illegible] 4

Name _____

Date _____ Period _____

Free Response: Calculator Active

[illegible]ions are given by

$$f(x) = \frac{2}{3}x + 5$$

$$g(x) = [illegible]_4(0 \quad 4)$$

[illegible]ues in the [illegible]nal [illegible]

[illegible]es of x in the domain of g.

[illegible]n by

$$= 2\log_9(10 - x) + \log_9(x + 5) - \log_9(10 - x)$$

$$h(x) = \frac{9(4)^{x-5}}{10(2)^{2x+2}}$$

i. Rewrite $f(x)$ as a single logarithm with base 9 without negative exponents in any part of the expression. Your result should be in the form $\log_9(\text{expression})$

ii. Rewrite $h(x)$ as a single exponential expression with base 2. Your result should be in the form $a(2)^{\text{expression}}$ where a is a constant.

Part C:

The function p is given by

$$p(x) = \log_3(x - 2) + \log_3(x + 2)$$

Find all the values in the domain of p that yields an output of $\log_3 8$.

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