

# Ap Calculus 2019 Frq

The image shows a handwritten solution for the 2019 AP Calculus Free Response Question 1, which involves analyzing two functions,  $E(t)$  and  $L(t)$ , representing fish entering and leaving a lake. The functions are defined as  $E(t) = 20 + 15 \sin(\frac{\pi}{6}t)$  and  $L(t) = 4 + 2^{0.1t^2}$ , where  $t$  is time in hours from midnight. The problem asks for the number of fish that enter the lake over the 5-hour period from midnight ( $t=0$ ) to 5 A.M. ( $t=5$ ).

The solution includes the following steps:

- Defining the functions:  $E(t) = 20 + 15 \sin(\frac{\pi}{6}t)$  fish/hr and  $L(t) = 4 + 2^{0.1t^2}$  fish/hr. A note indicates that 12 AM corresponds to  $t=0$ .
- Setting up the integral for the net number of fish entering:  $\int_0^5 (20 + 15 \sin(\frac{\pi}{6}t)) dt = 153.457...$ . The final answer is rounded to 153 fish.
- Calculating the net number of fish entering using the Fundamental Theorem of Calculus:  $[20t + 15 \cdot (-\cos(\frac{\pi}{6}t) \cdot \frac{1}{6})]_0^5$ .
- Final calculation:  $(100 - \frac{75}{8} \cos \frac{5\pi}{6}) - (0 - \frac{75}{8} \cos(0))$ .

## Conquering the AP Calculus 2019 FRQs: A Comprehensive Guide

Are you ready to tackle the infamous AP Calculus 2019 Free Response Questions (FRQs)? This comprehensive guide will dissect each question, providing detailed explanations, strategies, and insights to help you understand the concepts and improve your score. Whether you're aiming for a 5 or just want a better grasp of the material, this post will equip you with the tools you need to conquer the 2019 AP Calculus FRQs. We'll cover each question meticulously, explaining not just the solutions, but also the underlying calculus principles tested. Let's dive in!

## Understanding the AP Calculus 2019 FRQ Structure

Before we tackle the individual questions, it's crucial to understand the structure and scoring of the AP Calculus AB and BC exams. The FRQs are designed to assess your understanding of calculus concepts through application. Points are awarded not just for the final answer, but also for the steps, justifications, and correct use of notation. This means showing your work is paramount! The 2019 exam featured six FRQs, each testing a variety of topics.

## AP Calculus 2019 FRQ: Question 1 - (Analysis of a Function)

This question typically involves analyzing a given function, its derivative, or its integral. Expect to

encounter questions about:

Increasing/Decreasing Intervals: Finding intervals where the function is increasing or decreasing using the first derivative test.

Concavity and Inflection Points: Determining concavity and locating inflection points using the second derivative test.

Relative Extrema: Identifying relative maximum and minimum values using the first derivative test.

Graph Sketching: Sketching the graph of a function based on its properties.

Strategies for Success: Organize your work clearly. Label each step, state the tests you're using (e.g., First Derivative Test), and clearly indicate your reasoning.

## **AP Calculus 2019 FRQ: Question 2 - (Accumulation Functions)**

This question often revolves around the concept of accumulation functions, often expressed as an integral. You'll likely encounter:

Fundamental Theorem of Calculus: Applying the FTC to evaluate derivatives and integrals involving accumulation functions.

Interpreting Integrals: Understanding the meaning of definite integrals in context (e.g., area, displacement, total change).

Related Rates: Possibly involving the chain rule in the context of accumulation.

Strategies for Success: Pay close attention to the units and context provided. Clearly show your use of the FTC, and don't forget to address the units in your final answer.

## **AP Calculus 2019 FRQ: Question 3 - (Differential Equations)**

Expect questions involving:

Slope Fields: Sketching and interpreting slope fields.

Separation of Variables: Solving separable differential equations.

Euler's Method: Approximating solutions to differential equations using Euler's method.

Applications of Differential Equations: Modeling real-world scenarios using differential equations (e.g., population growth, radioactive decay).

Strategies for Success: Show all your steps in solving differential equations. For Euler's method, clearly indicate your steps and calculations.

## **AP Calculus 2019 FRQ: Question 4 - (Applications of Integration)**

This question is likely to involve:

Area Between Curves: Calculating the area between two curves using integration.

Volumes of Solids of Revolution: Finding volumes using methods like disk/washer or shell method.

Average Value of a Function: Calculating the average value of a function over an interval.

Strategies for Success: Draw a diagram to visualize the problem. Clearly indicate the integrand and limits of integration. Choose the appropriate method for calculating volumes.

## **AP Calculus 2019 FRQ: Question 5 - (Series) (BC Only)**

This question is exclusive to the AP Calculus BC exam and focuses on:

Convergence Tests: Applying various convergence tests (e.g., integral test, ratio test, comparison test).

Taylor and Maclaurin Series: Finding Taylor or Maclaurin series for a given function.

Radius and Interval of Convergence: Determining the radius and interval of convergence of a power series.

Strategies for Success: Clearly state which convergence test you are using and show all your steps. For Taylor/Maclaurin series, be mindful of the formula and the correct derivatives.

## **AP Calculus 2019 FRQ: Question 6 - (Parametric Equations, Polar Coordinates, or Vector-Valued Functions) (BC Only)**

This question (also BC only) could involve:

Parametric Equations: Finding derivatives, arc length, or area under a curve defined parametrically.

Polar Coordinates: Finding areas, slopes, or tangents of curves defined in polar coordinates.

Vector-Valued Functions: Working with vectors, velocity, acceleration, and curvature.

Strategies for Success: Use the appropriate formulas for the specific type of question (parametric, polar, or vector). Draw diagrams to help visualize the problem.

## Conclusion

Mastering the AP Calculus 2019 FRQs requires consistent practice and a strong understanding of fundamental concepts. By understanding the question types, employing effective strategies, and showing your work meticulously, you'll significantly increase your chances of success. Remember to review your notes, practice past FRQs, and seek help when needed. Good luck!

## FAQs

1. Where can I find the actual 2019 AP Calculus FRQs? You can find the released questions on the College Board website.
2. Are calculators allowed on the FRQ section? Yes, for most parts, but some sections might prohibit calculator use. Check the specific instructions.
3. What is the best way to study for the FRQs? Consistent practice is key. Work through as many past FRQs as possible, focusing on understanding the underlying concepts.
4. How much weight do the FRQs carry on the AP exam score? The FRQs contribute significantly to the final score, so mastering them is essential.
5. Are there any resources available beyond this blog post to help me prepare? Yes! Numerous online resources, textbooks, and AP Calculus review books are available. Your teacher can also provide valuable assistance.

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