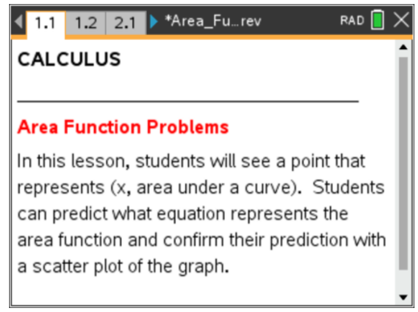

Math Objectives

- Students will extend the understanding of the relationship between the area under a derivative curve and the antiderivative function.

Activity Types

- Group Activity

About the Lesson

- Students will move an open circle point along the *x*-axis to see a graph of the antiderivative function automatically captured. Students will predict the antiderivative function and graph their prediction to see if it matches the antiderivative function.

Directions

- For each problem, drag the empty point on the *x*-axis and watch point *P* move across the graph. Next, move to page 2 of the problem and use **f**2(*x*) to type a possible function that point *P* is modeling. Determine if the function matches the scatter plot of the area function.

TI-Nspire™ Technology Skills:

- Download a TI-Nspire document
- Open a document
- Move between pages
- Grab and drag a point

Tech Tips:

- Make sure the font size on your TI-Nspire handheld is set to Medium.
- You can hide the function entry line by pressing ctrl G.

Lesson Materials:

Student Activity
Area_Function_Problems_Student.pdf
Area_Function_Problems_Student.doc

TI-Nspire document
Area_Function_Problems.tns

Visit www.mathnspired.com for lesson updates.

Discussion Points and Possible Answers

Move to page 2.1.

Students will record the antiderivative function for each problem. Students may include + *C* in their answers if the concept has been discussed before this activity. If not, questions 6 and 8 address the difference of a constant in the antiderivative function.

Problem 2: **Answer:** $3x$

> **Class Discussion:** Can you generalize the antiderivative functions of constant functions?

Problem 3: **Answer:** $\frac{1}{2}x^2$

> **Class Discussion:** Can you generalize the antiderivative functions of linear functions?

Problem 4: **Answer:** $\frac{1}{3}x^3$

Problem 5 **Answer:** $\frac{1}{4}x^4$

Problem 6: **Answer:** $\frac{1}{3}x^3 - x^2 + x - \frac{1}{3}$

> **Class Discussion:** What is the difference between the antiderivative function in problem 4 and problem 6?

Problem 7: **Answer:** $\frac{1}{2}x^2 - 3.125$

> **Class Discussion:** Why is the area negative when the left endpoint is in the first quadrant? Why does moving the left interval to the left make the total area positive?

Problem 8: **Answer:** $\frac{1}{3}x^3 - x^2 + x - 3$

Class Discussion: How is this problem different than problem 6?

Students will use the results from the activity to answer these questions.

1. What is the antiderivative function of **f**(x) = –2?

   Answer: $-2x + C$

2. What is the antiderivative function of **f**(x) = k?

   Answer: $kx + C$

3. What is the antiderivative function of **f**(x) = $mx + b$?

   Answer: $\frac{m}{2}x^2 + bx + C$

4. What is the difference between the antiderivative function of problem 4 and that of problem 6?

   Sample answer: The antiderivative function in problem 6 is translated down and to the right.

5. Why is the area negative when the left endpoint is in the first quadrant?

   Sample answer: The area is negative because the point you move is to the left of the fixed endpoint.

6. When does moving the left endpoint further to the left make the total area positive?

   Sample answer: The area will become positive when moving the left endpoint further to the left when the function is below the x-axis. Moving to the left is a negative area and below the x-axis is a negative area, so the total area becomes positive.

7. What is the difference between the antiderivative function of problem 6 and that of problem 8?

   Sample answer: The antiderivative in problem 8 is translated down farther.