

September 10

Compare and Contrast  
integrals with RAM.



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Students will verbally explain how to  
find the exact area under a curve using  
definite integrals

(using the words:  
right, left, above, below, antiderivative...)

definite integral:

$$\int_a^b f(x) dx$$

gives the exact  
area between the  
curve & the x-axis



Open the TI-Nspire document *Definitive\_Integral*.

In this activity, you will use a graphical representation to explore the definite integral of a continuous function. You will change the upper and lower limits,  $a$  and  $b$ , of the integral  $\int_a^b f(x) dx$  and observe the resulting changes in the graph and the value of the definite integral.



Move to page 1.2.

Press **2nd** and **2nd** to navigate through the lesson.

- The graph shown is of the function  $y = f(x)$ . The definite integral of  $f(x)$  from  $a$  to  $b$  is given by  $\int_a^b f(x) dx$ . For example,  $\int_0^2 f(x) dx$  is the definite integral of  $f(x)$  from 0 to 2, or between  $x = 0$  and  $x = 2$ .

Drag points  $a$  and  $b$  along the  $x$ -axis to determine the values of the following definite integrals, where  $f$  is the function shown in the graph.

- $\int_0^2 f(x) dx =$  \_\_\_\_\_
- $\int_0^3 f(x) dx =$  \_\_\_\_\_
- $\int_{-1}^0 f(x) dx =$  \_\_\_\_\_

$$\int_a^b f(x) dx = 2.14$$

- Drag point  $a$  to  $-3$  and move point  $b$  to determine the following:
  - For what values of  $b$  is  $\int_{-3}^b f(x) dx$  positive? What do you observe about the shaded region and the graph of  $f$  when  $\int_{-3}^b f(x) dx$  is positive?
  - For what values of  $b$  is  $\int_{-3}^b f(x) dx$  negative? What do you observe about the shaded region and the graph of  $f$  when  $\int_{-3}^b f(x) dx$  is negative?
  - For what values of  $b$  does  $\int_{-3}^b f(x) dx = 0$ ? What do you observe about the shaded region and the graph of  $f$  when  $\int_{-3}^b f(x) dx = 0$ ?

- Based on your observations on pages 1.2 and 2.2, for any continuous function  $f$  on an interval  $[c, d]$  and for  $a$  and  $b$  in  $[c, d]$ , when will the definite integral  $\int_a^b f(x) dx$  be positive? Negative? Zero? Clearly explain your generalization.

(4 cases)