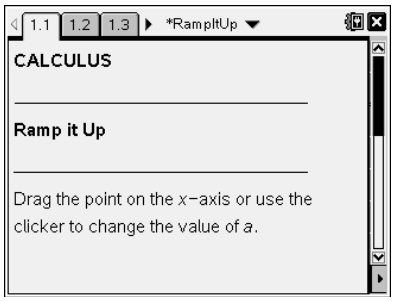
Open the TI-Nspire document *Ramp_It_Up*.



The purpose of this activity is to introduce one definition of the natural logarithm function, that is, $\ln x = \int_1^x \frac{1}{t} dt$. This activity allows you to visualize this definition and to discover some of the properties of the natural logarithm function and its graph.

Move to page 1.2.

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

The **natural logarithm**, ln(*a*), can be defined as the area under the curve of $\frac{1}{t}$ from 1 to *a*. The graph on page 1.3 represents this area. Grab and drag the point *a*, or use the slider in the top-right portion of the page, to see the definition in action.

1. The computed area of the shaded region is equivalent to ln(*a*), the value of the natural logarithm function.

   a. Complete the following table.

a	0	0.5	1	1.5	2	2.5
ln(*a*)						

   b. When is ln(*a*) negative? Why?

   c. When is ln(*a*) equal to zero? Use the graph and the definition of ln(*a*) to explain your answer.

Move to page 2.1.

2. The Calvert Construction Company is designing a ramp for a new project, starting with a model. A sketch of a cross section of part of the ramp is given on page 2.1. The shaded area represents the support system for the ramp. Your job is to help the design team with some measurements for the model.

   a. The graph shows $\mathbf{f1}(t) = \int_1^a \frac{100}{t}\,dt$. What expression can be used to find the area under the model ramp for any value of *a*?

   b. What is the exact area of the support system under the model ramp when *a* = 8.75? Use the bottom of page 2.3 for calculations.

   c. Complete the following table. Round your answers to the nearest hundredth.

a	7	7.25	7.75	8.25	8.6	9.3
Area						

   d. **Extension:** If the model ramp is designed to have a support system 7.25 inches long (*a* = 7.25) and 15 inches deep, what would be the **volume** of the support system under the ramp?