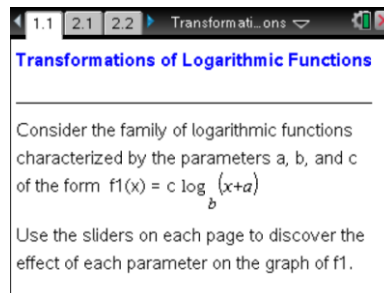**Open the TI-Nspire document** *Transformations_of_*
Logarithmic_Functions.tns.

In this activity, you will examine the family of logarithmic functions
of the form $f(x) = c \log_b(x+a)$ where a, b, and c are
parameters.

> | 1.1 | 2.1 | 2.2 | ▶ Transformati…ons ▽ |
>
> **Transformations of Logarithmic Functions**
>
> Consider the family of logarithmic functions
> characterized by the parameters a, b, and c
> of the form f1(x) = c log $(x+a)$
>   b
>
> Use the sliders on each page to discover the
> effect of each parameter on the graph of f1.

The parameter b is the base of the logarithmic function and $b > 0, b \neq 1$. Using the sliders in the left
panel of each page, change the value of a parameter, and record the effect of each parameter change
on the graph of the corresponding logarithmic function. At the end of this activity, use your results to
match each function with its corresponding graph.

Note: The slider for the base b is constructed to use the specific values in the column labeled **blist** in
the Lists & Spreadsheets page.

Move to page 2.1.

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

1. The graph of $y = f1(x) = \log_b x$ is shown in the right panel. Click the arrows to change the value
    of b, and observe the changes in the graph of $f1$.
    a. Explain why for every value of b, the graph of $f1$ passes through the point $(1,0)$.

    b. For $b > 1$, describe the graph of $y = f1(x) = \log_b x$.

    c. For $0 < b < 1$, describe the graph of $y = f1(x) = \log_b x$.

    d. Find the domain and range of function $f1(x) = \log_b x$ for all possible values of b.

    e. Describe the behavior of the graph of $y = \log_b x$ near the y-axis.

Move to page 3.1.
2. The graph of $y = f1(x) = \log_b(x+a)$ is shown in the right panel. For various (fixed) values of b,
    click the arrows to change the value of a, and observe the changes in the graph of $f1$. Describe
    the effect of the parameter a on the graph of $y = \log_b(x+a)$.

Move to page 4.1.

3. The graph of $y = f1(x) = c \cdot \log_b(x+a)$ is shown in the right panel. For various (fixed) values of a and b, click the arrows to change the value of c, and observe the changes in the graph of $f1$. Describe the effect of the parameter c on the graph of $y = c \cdot \log_b(x+a)$.

4. Without using your calculator, match each equation with its corresponding graph below.

(a) $f(x) = \log_3(x+4)$

(b) $f(x) = \log_{1/4}(x)$

(c) $f(x) = -\log_4(x-2)$

(d) $f(x) = -3\log_{1/2}(x+1)$

(e) $f(x) = \log_e(x) = \ln x$

(f) $f(x) = 5\log_{1/5}(x+5)$

(i)

(ii)

(iii)

(iv)

(v)

(vi)