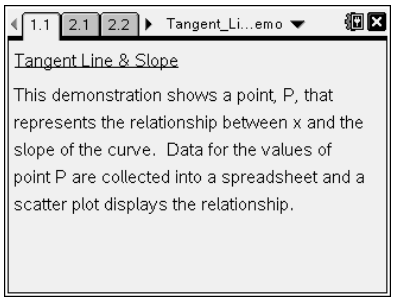
Tangent Line Demonstration
Student Activity

Name _____
Class _____

Open the TI-Nspire document *Tangent_Line_Demo.tns.*

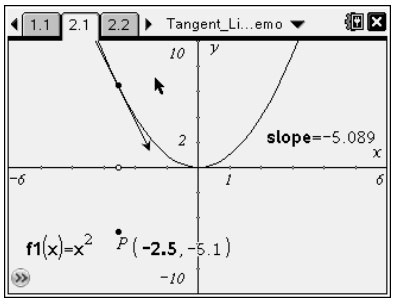


Objective: To make a connection between the slope of the tangent line at a point and the function that represents the slope at all tangent points to a function.

Directions: Follow the steps below to complete the activity.

Move to page 2.1.

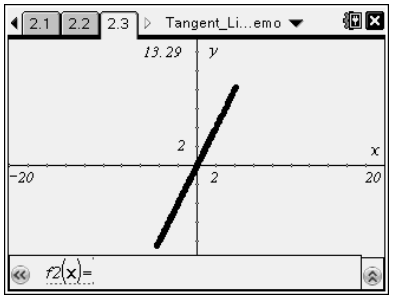
Press ctrl ▶ and ctrl ◀ to navigate through the lesson.



On page 2.1 of the TI-Nspire document, you will see this graph. On this graph, the function graphed is **f1**(x) = x^2. The tangent line and slope of the tangent are shown. Point *P* represents the coordinates (x value, slope of tangent line) and is labeled along with the coordinates.
Grab and move the empty circle on the x-axis and watch the tangent line and point *P* move.

1. Can you predict what function point *P* is tracing?

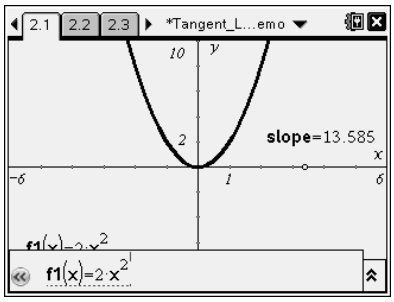
Move to page 2.3.



You will see a scatter plot of the points that *P* traced on the page. For this example, the graph should look like this.
Enter your prediction function in the entry line for **f3**(x) and see if your prediction matches the scatter plot. You can change the function you enter as many times as needed until you get a match. The function that matches the scatter plot is called the derivative function.

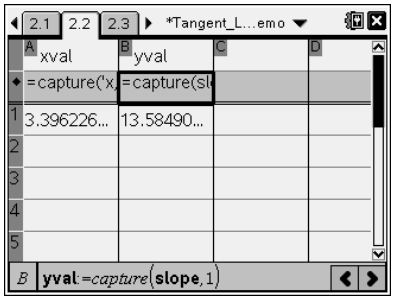
2. What is the derivative function of **f**(x) = x^2?

To explore other functions, use these steps to change the function and clear the collected data.



Step 1: Go to page 2.1 and change the function by clicking on double arrow in the lower left corner. Click in the entry line and press the up arrow to see **f**1(*x*) and edit the equation.

Step 2: Go to page 2.2 and highlight the formula cells in columns A and B with the word *capture* and then press (enter) twice.



Step 3: Return to page 2.1 and begin the lesson steps again.

Exploration 1: Now that you have found the derivative function for **f**(x) = x^2, explore some other variations of this function and see if you can find a pattern in their derivatives.

Record the derivative functions and any patterns you saw.

3. **f**(x) = ax^2, where a equals 2, 3, 4, etc., until you see a pattern.

4. **f**(x) = $(x - a)^2$, where a equals 2, 3, 4, etc., until you see a pattern.

5. **f**(x) = $ax^2 + b$; keep a constant and change b.

Record the derivative functions and any patterns you saw here:

Exploration 2: Begin by finding the derivative function for $\mathbf{f}(x) = x^3$.

6. What is the derivative function of $\mathbf{f}(x) = x^3$? _____

Now explore some other variations of this function and see if you can find a pattern in their derivatives.

7. $\mathbf{f}(x) = ax^3$, where a equals 2, 3, 4, etc., until you see a pattern.

8. $\mathbf{f}(x) = (x - a)^3$, where a equals 2, 3, 4, etc., until you see a pattern.

9. $\mathbf{f}(x) = ax^3 + b$; keep a constant and change b.

Record the derivative functions and any patterns you saw here:

