

Secant to Tangent

by – Lynda Ferneyhough

Activity overview

Students will enter a function and investigate the slope of the secant as it moves closer to becoming a tangent.

Concepts

- Limits
- Slope of a secant and tangent line segment

Teacher preparation

The directions for the activity are in the calculator file.

Classroom management tips

Each student can be given a different function by using the last four digits of their student number as the coefficients in a cubic function. Positive and negative signs can be used alternately. It is easier to see the affect of the investigation with a cubic function with visible local maximum and local minimum points.

TI-Nspire Applications

TI-Nspire Graphs, Lists & Spreadsheets and Notes Applications are used.

Step-by-step directions

Students are going to enter a function and investigate the slope of the secant as it moves closer to becoming a tangent.

Open a Graphs page.

Enter a cubic function $f1(x) = ax^3 + bx^2 - cx - d$ using the last four digits of their student number for the coefficients a,b,c,d.

Alter the window as necessary.

An example is shown here.

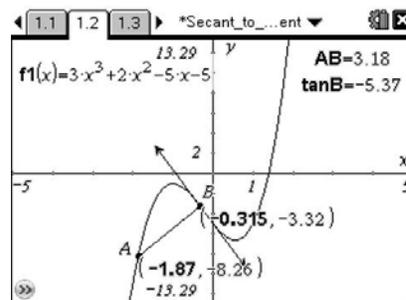
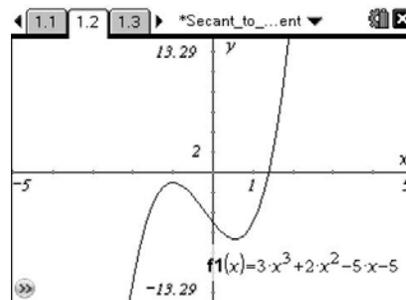
Place two points, A, B on the curve and a line between them.

Measure the slope of the segment AB and store as **AB**.

Store the x-coordinate of point A as **xa**.

Store the x-coordinate of point B as **xb**.

Draw a tangent at point B, measure the slope of the tangent and store as **tanB**.



Open a Lists & Spreadsheet page.

Call column A x_{coa} , column B x_{cob} , column C slope, and column D tangent.

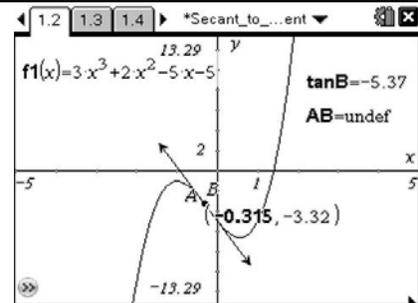
In column A's formula line do an automatic data capture of x_a , in column B enter $=x_b$, in column C capture AB , and in column D enter $=\tan B$.

Return to the graph, grab point A and slowly move it closer to point B.

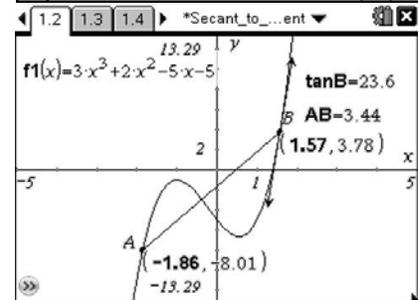
When you return to the Lists & Spreadsheet page, notice what is happening to the slope of the secant as A moves closer to point B.

Move point B and look at the investigation again.

Clear the values in the spreadsheet before starting.



| A | B | C | D | E |
|-------------------|-----------|-------------------|-----------|---|
| x_{coa} | x_{cob} | slope | tangent | |
| $=\text{capture}$ | $=x_b$ | $=\text{capture}$ | $=\tan b$ | |
| -1.869... | -0.314... | 3.17533 | -5.36756 | |
| -1.828... | -0.314... | 2.7671 | -5.36756 | |
| -1.8146 | -0.314... | 2.6297 | -5.36756 | |
| -1.807... | -0.314... | 2.55683 | -5.36756 | |
| -1.799... | -0.314... | 2.4843 | -5.36756 | |



Student TI-Nspire Document

Secant_to_Tangent.tns

1.1 1.2 1.3 Secant_to_T...ent

You are going to enter a function and investigate the slope of the secant as it moves closer to becoming a tangent.

The next page is a Graphs page.

Enter a function $f(x) = ax^3 + bx^2 - cx - d$ using the last four digits of your student number for the coefficients a, b, c, d .

Alter the window as necessary.

1.2 1.3 1.4 Secant_to_T...ent

The next page is a Lists & Spreadsheet one.

Call column A x_{coa} , column B x_{cob} , column C slope, and column D tangent.

In column A's formula line do an automatic data capture of x_a , in column B's enter $=x_b$, in column C's capture AB , and in column D's enter $=\tan B$.

1.1 1.2 1.3 Secant_to_T...ent

1.3 1.4 1.5 Secant_to_T...ent

| A | B | C | D |
|-------------------|--------|-------------------|-----------|
| $=\text{capture}$ | $=x_b$ | $=\text{capture}$ | $=\tan b$ |
| | | | |
| | | | |
| | | | |
| | | | |

1.1 1.2 1.3 Secant_to_T...ent

Place two points, A, B on the curve and a line between them.

Measure the slope of the segment AB store the slope as AB.

Store the x-coordinate of point A as x_a .

Store the x-coordinate of point B as x_b .

Draw a tangent at point B, measure the slope of the tangent and store as $\tan B$.

1.4 1.5 1.6 Secant_to_T...ent

Return to the graph, grab point A and slowly move it closer to point B.

When you return to the Lists & Spreadsheet page, notice what is happening to the slope of the secant as A moves closer to point B.

Move point B and look at the investigation again.