About the Mathematics

Newton's Method uses successive tangent line approximations to iteratively find zeroes of a function. The idea: starting with an initial guess $x0$ of a zero for the function **f,** one finds the zero for the tangent line approximation to the graph of **f** at $(x0, \mathbf{f}(x0))$, namely the solution $x = x1$ to $0 = \mathbf{f}'(x0)(x - x0) + \mathbf{f}(x0)$, or equivalently $x1 = x0 - \dfrac{\mathbf{f}(x0)}{\mathbf{f}'(x0)}$.

One then uses $x1$ as the next guess of a root and repeats the process until it converges.

Math Objective

- Students will have an opportunity to visually see the geometry and calculus behind Newton's Method.

Using the Documents

Page 1.1 provides the setting and the iterative formula for Newton's Method. On page 1.2, a slider has been set up to allow the user to step through Newton's Method step by step. The function under consideration can be changed by editing **f1**(*x*)*.* You can bring up the function editing line by pressing (ctrl) **G**. The initial guess can be edited in the interactive math box in the lower left pane of the screen.

NOTE: The *Newton's_Method_CAS.tns* document makes use of the symbolic derivative for **f1**(*x*) and is intended for TI-Nspire CAS, while the *Newton's_Method_Numeric.tns* document makes use of the numeric derivative and is intended for the TI-Nspire handheld.

Possible Applications

This tool can be used to help students explore questions like the following. When will Newton's Method return a next guess identical to the input guess? When will the Newton's Method iterative formula be undefined? Why does that make sense geometrically? Can you come up with a function and an initial guess that oscillates between two values?
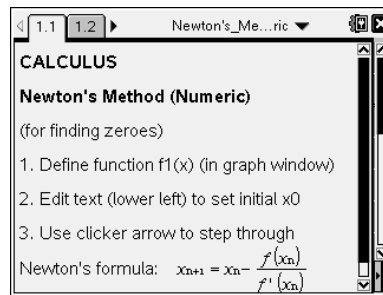
TI-Nspire™ Technology Skills:
- Download a TI-Nspire document
- Open a document
- Move between pages
- Enter text on a function entry line
- Click on a minimized slider

Tech Tips:
- Make sure the font size on your TI-Nspire handheld is set to Medium.
- You can hide the function entry line by pressing (ctrl) **G**.

Lesson Materials:
Newton's_Method_CAS.tns
Newton's_Method_Numeric.tns

Visit www.mathnspired.com for lesson updates.