TI-nspire™

Grade level: 7-9
Subject: Algebra I
Time required: 40 minutes

What Makes a Good Graph?

by – Sean Turkington

Activity overview

In this activity, intended for Algebra I classrooms, students use their TI-Nspire handhelds to create graphs of various functions. The goal is for them to transfer the graphs from the handhelds to graph paper maintaining the key features of the graph. Students will begin to develop an understanding of intercepts, relative maximums/minimums, and end-behavior.

Concepts

Graphing functions, intercepts, relative extrema, end-behavior.

Teacher preparation

Prior to beginning the activity the teacher should

- *Students should be familiar with each of the following capabilities of the TI-Nspire: putting points on curves, grabbing and dragging points, changing point locations by changing x- or y-coordinates directly, and grabbing and moving labels of objects.*
- *Students should be familiar with x- and y-intercepts of graphs.*
- *Make sure each student handheld has a copy of the .tns file.*
- *Have graph paper available for students to use as necessary. The focus is really on students transferring the graph as accurately as possible from handheld to paper so graph paper is essential.*

Classroom management tips

The activity can be made more manageable by

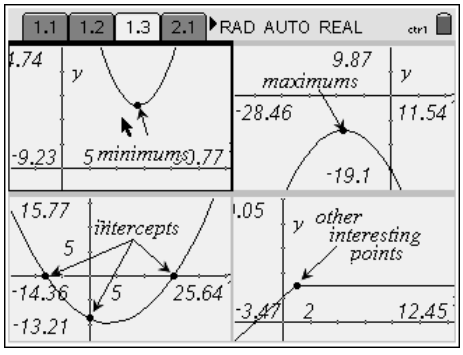
- *Providing students with a reference sheet of what to press to make different things happen*
- *Having students sit with partners and allowing them to consult with each other throughout the activity.*

TI-Nspire Applications

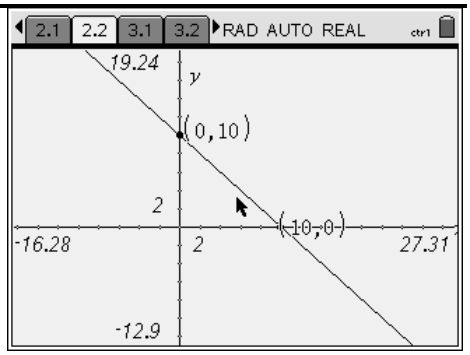
Graphs & Geometry, Notes

Step-by-step directions

The first problem, pages 1.1 to 1.3, is just a title page and a description of what the students will be looking for on each graph they encounter. This includes both a description of the key points and a visual representation.

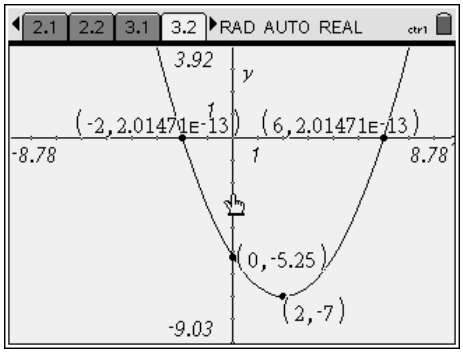


Problem 2 is a linear equation (students should recognize this one). Page 2.1 tells students specifically what they are looking for and how many of them. Students need to be able to place a point on the line and then move the points to the intercepts. They can move the points either by grabbing and dragging them or by directly changing the x-value of one point to 0 and the y-value of the second point to 0. Sample student for page 2.2 work is shown to the right.



Make sure to direct student attention to the scale indicated by the TI-Nspire. This is the scale they should use on their graph paper.

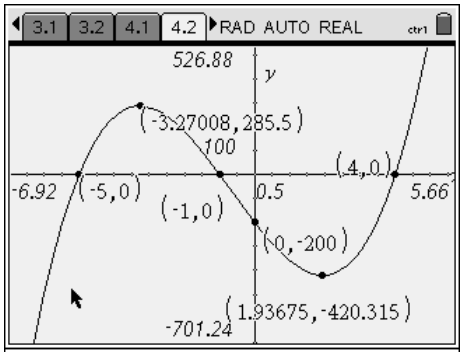
Problem 3 is a quadratic equation (students do not need to know this to complete the problem). Page 3.1 tells students exactly what key points to look for. Again, students must add points on the curve and move them by any method they prefer to the appropriate location. Sample student work for page 3.2 is shown to the right.



This problem will likely lead to class discussion. Throughout their mathematical careers students will have to understand the output of technology, in this case the TI-Nspire is approximating the zeros of the graph but showing a very small decimal (in scientific notation, no less) instead of zero. Students accept this readily after a short discussion.

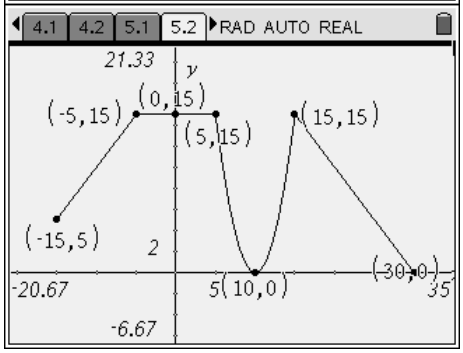
Again make sure students take note of the scale the TI-Nspire is using.

Problem 4 is a cubic equation (students need not know this). Page 4.1 details the key points they should find. Sample student work for page 4.2 is shown to the right. It is likely that students will have to grab and move the coordinates of the points on the curve.



The scale set by the TI-Nspire on this problem is particularly important. It takes students a while to accept a rectangular coordinate system (rather than a square coordinate system).

Problem 5 is a piecewise-function (three linear sections and a quadratic). On page 5.1 students are told what to look for on the graph. This graph has several "interesting points" but is defined in such a way that it is continuous for all x from -15 to 30. This problem is here to illustrate that technology will really let them explore all sorts of graphs and that the techniques they are learning are applicable to more complicated things as well. Sample student work for page 5.2 is shown to the right.



Problem 6 is a collection of problems designed to make students return to the previous questions and look more closely

at the points they found on the graphs. Answers to the questions are as follows:
6.1: They all have 0 for a y-coordinate.
6.2: No graph had more than one x-intercept.
6.3: As the graph approaches a maximum from left to right the y-values increase. y-values decrease once you're past the maximum.
6.4: As the graph approaches a minimum from left to right the y-values decrease. y-values increase once you're past the maximum.

Assessment and evaluation

- *Collect student graphs at the end of the activity and review them for accuracy. Of particular interest are: appropriate scale, the intercepts, any extrema, and end-behavior of the graphs*

Activity extensions

- *Students can be given additional functions to graph. This can either be done by giving them the equations and having them enter them in the equation editor or by typing them in yourself. This can be made more challenging by requiring students to find appropriate viewing windows on their own.*

Student TI-Nspire Document

File: MakeGoodGraph_Turk.tns