

Exploring and modeling exponential functions with TI-Nspire™ Navigator™

Maria Wærn – Åva Gymnasium, Täby, Sweden

Case Study



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Teacher	Maria Wærn
Location	Ava Gymnasium, Täby, Sweden
Class	16-17 year old students on a preparatory year for the International Baccalaureate programme
Technology	TI-Nspire™ Navigator™

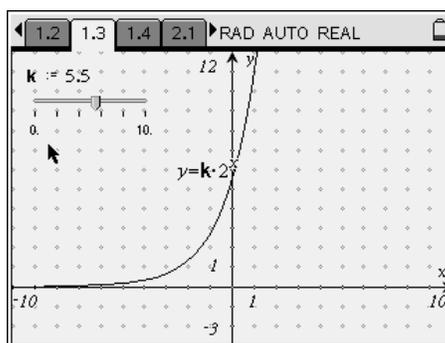
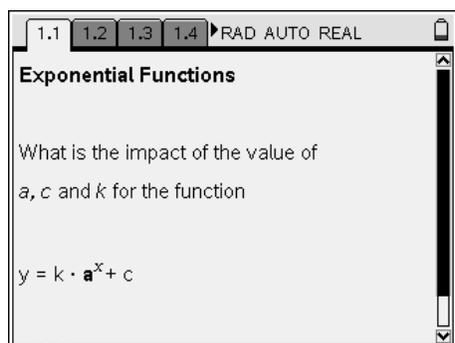
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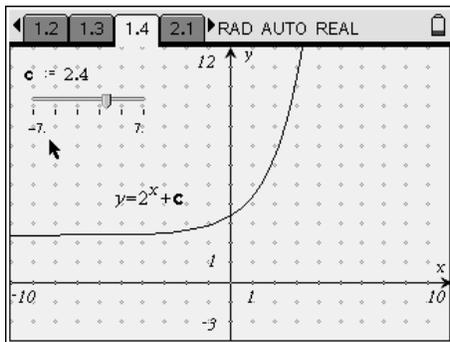
The students have been using their own TI-Nspire™ handhelds since September 2008 and I started to use TI-Nspire™ Navigator™ with them in May 2009. In this lesson sequence I used the File transfer, Screen Capture, Live Presenter features and I plugged in the GoTemp probe to my TI-Nspire™ handheld to do the data collection.

The lessons

This activity was in several parts across two lessons and initially we looked at the effect of doubling numbers within a spreadsheet to introduce the idea of an exponential function of the type $y = a^x$.

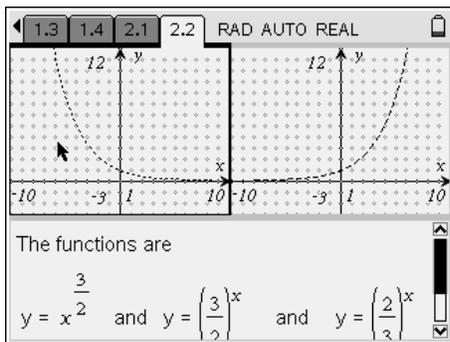
I then transferred a pre-constructed file to the students which required them to change the values of a , c and k , in three different scenarios.



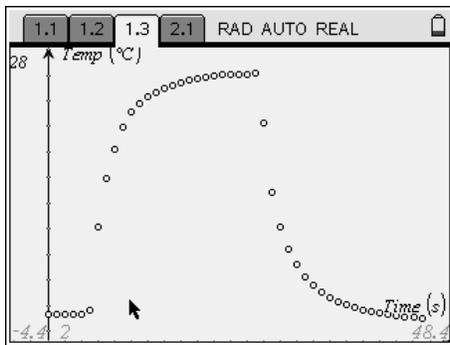


We then began to explore this graphically and we focused on observing the features of exponential functions and identifying the most important properties in relation to the resulting graphs. I wanted the students to get a feeling for what impact the values of a , c and k have on the graph of the function $y = ka^x + c$ and to be introduced to the concept of an asymptote.

Following this activity, the students completed a graph matching task which drew upon the main properties they had discovered so that they could distinguish between the different types of graphs they had been producing.



In the next lesson, I wanted to provide the students with an opportunity to engage in a mathematical modelling task with real data so I brought a cup of hot tea and a cup of cold water to the class. I made myself the Live Presenter and connected the GoTemp™ probe to my TI-Nspire™ handheld. Having plunged the temperature probe first into the hot tea, and secondly into the cold water, the following graph was quickly produced.



I sent the TI-Nspire™ file containing this graph directly to the students from my own handheld and set the students the task of trying to model a part of the graph using their new knowledge of exponential functions.

Students' mathematical learning

During the exploratory stage, the use of Screen capture and Live Presenter enabled many students to contribute what they were finding out to the class discussions and I was able to question them directly where I thought that particular features had been overlooked or misinterpreted. The appearance of the graph when changing the value of a is very powerful and some students also tried to add a number to see what impact that would have. This method really encourages them to explore and analyze maths in a manner they never thought about before.

I was able to identify the students who were less confident with working with decimal and negative values as we left the natural number world behind and support them through the whole class discussions.

Conclusion

In this activity Screen Capture was an essential tool to enable me to pick out a graph I wanted to discuss with the class and this also told the students that it is their contribution and not the teacher's who does everything all the time. With TI-Nspire™ Navigator™ the students were part of the contribution in a completely different way and it felt as though they appreciated their increased involvement. The value of letting the students discover different parts of maths is enormous and I think it will trigger off new approaches from the students that I don't know yet. It is very exciting, I think, and maybe also a bit scary?