Algebra Activity:
Dynamic Graphing part 3 - Exploring Exponential Functions

CALCULATORS: Casio: *fx-9860G*

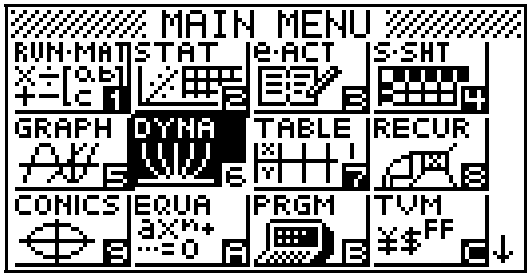
INTRODUCTION:
An exponential function is a function whose rate of increase or decrease accelerates.

Basic exponential functions can be expressed in the form $y = a \times b^x$, where *a* represents an initial quantity and *b* represents the exponential factor, with *b* > 1 and $b \neq 0$.

When students are first learning about the graphing of exponential functions in early algebra studies, it is often useful to investigate the role of the variables *a* and *b.*

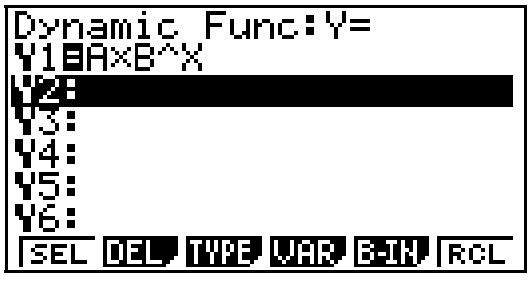
The Dynamic Graphing capabilities of the Casio *fx-9860G* are not restricted to the seven Built-In functions! This activity will demonstrate how to create your own Dynamic Function.

PROCEDURE:



From the Main Menu, select the Dynamic Graphing mode (mode #6).

Make sure the list of functions is cleared by scrolling to each function and pressing
[F2] (DEL) **[F1]** (Yes)
while the function is selected.



With function Y1 highlighted, type:
[ALPHA]-[X,*q*,T] [´] [ALPHA]-[log] [^] [X,*q*,T] [EXE]
This will store the function $Y = A \times B^X$ as the Dynamic Function. The *fx-9860G* will interpret A and B as possible Dynamic Variables.

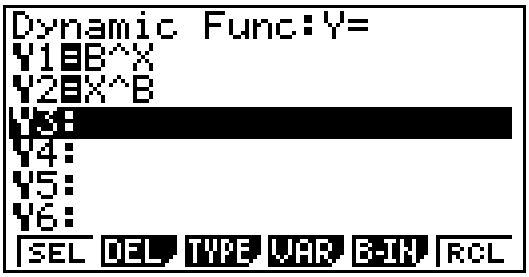
Press **[F4]** (VAR) to begin setting parameters for the variables in $Y = A \times B^X$.

Type **[1] [EXE]** to set the value of A to 1. Then, while variable B is highlighted, press **[F1]** (SEL) to select it as the Dynamic Variable.

Press **[F2]** (SET). Enter a Start value of 0.25, an End value of 3, and a Step value of 0.25. Then exit this screen and dynamically graph the function.

<u>Exercise.</u> Find viewing window settings that give a good picture of this animation without wasting a lot of screen real estate. (Consider the domains and ranges of the exponential functions that are being dynamically graphed.)

It is also possible to dynamically graph more than one function at a time. For example, suppose we wish to compare the graphs of $y = 2^x$ and $y = x^2$. We can generalize this to a comparison between $y = b^x$ and $y = x^b$.

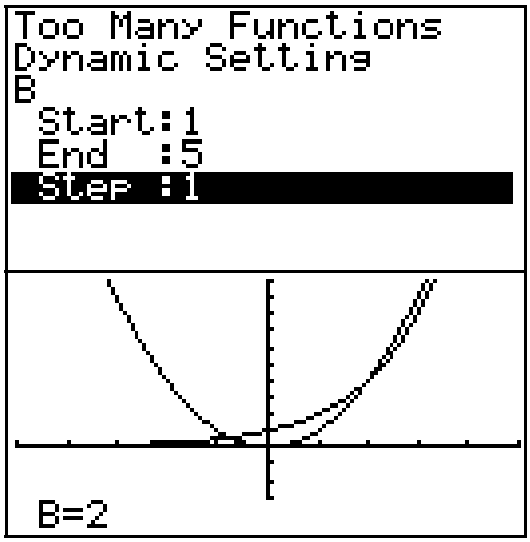


Return to the Dynamic Function screen (using **[EXIT]** as necessary), and enter B^X and X^B for the functions Y1 and Y2 respectively. Be sure to press **[EXE]** after entering each function.

Press **[F4]** (VAR). Notice that a message appears at the top of the screen indicating "Too Many Functions." This is a warning, but since you wisely chose B as a common variable to both functions, you can ignore the warning!

Press **[F2]** (SET), and enter 1, 5, and 1 for the values of Start, End, and Step. Then **[EXIT]**.

Press **[F3]** (SPEED), then **[F1]** (||▷) to set the animation speed to "Stop&Go". Then **[EXIT]**, and press **[F6]** (DYNA) to animate.

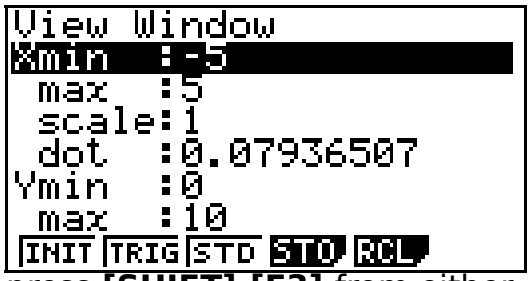


You can now compare rates of increase, intersection points, and more!

SOLUTIONS TO EXERCISES:

Exercise. Most importantly, Y > 0 no matter what the values of A and B are. Therefore, we should set Ymin = 0. Here is one possible correct answer to this exercise:

Xmin = – 5
max = 5
scale = 1
Ymin = 0
max = 10
scale = 1



Remember: to access View-Window settings, press **[SHIFT]-[F3]** from either the Dynamic Function or Dynamic Variable screens.