

Algebra Activity: Dynamic Graphing part 2 - Exploring Quadratic Functions

CALCULATORS: Casio: *fx-9860G*

INTRODUCTION:

A quadratic function is a function whose graph is that of a parabola.

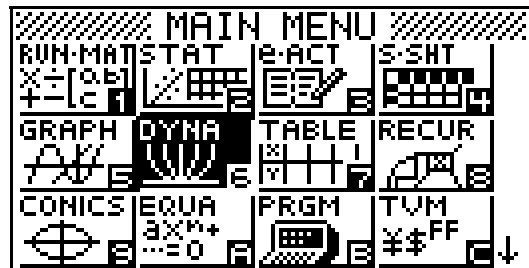
All quadratic functions can be expressed in standard form, $y = ax^2 + bx + c$, where a represents the dilation of the parabola and c represents its y -intercept.

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

The Dynamic Graphing capabilities of the Casio *fx-9860G* can be used as an effective teaching tool for such a demonstration.

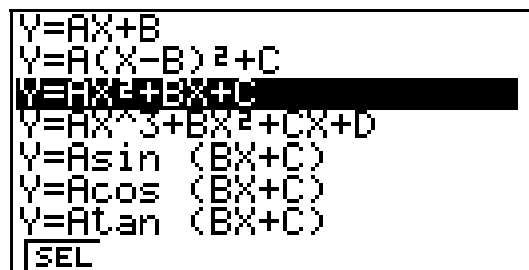
PROCEDURE:

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



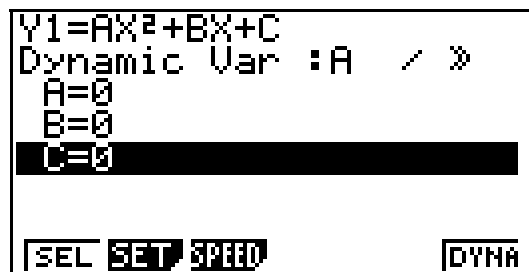
Make sure the list of functions is cleared by scrolling to each function and pressing

[F2] (DEL) **[F1]** (Yes) while the function is selected.



Press **[F5]** (B-IN) to display the list of built-in basic functions, then **[] []** **[EXE]** to select the basic quadratic function $Y=AX^2+BX+C$.

Press **[F4]** (VAR) to begin setting parameters for the variables in $Y=AX^2+BX+C$.



While variable A is highlighted, press

[F1] (SEL) to select it as the Dynamic Variable.
Then make the values of A, B, & C equal zero.

Press **[F2]** (SET). Enter a Start value of -3, an End value of 3, and a Step value of 0.5. Then exit this screen and dynamically graph the function. Notice that all of the parabolas are centered at the origin, but their dilations are varying with the value of A.

```

Y1=AX^2+BX+C
Dynamic Setting
A
  Start: -3
  End   : 3
  Step  : 0.5
  
```

Press **[AC/ON]** and **[EXIT]** to return to the Dynamic Variable screen. Change the value of A to 1, and select C as the Dynamic Variable. Then animate.

```

Y1=AX^2+BX+C
Dynamic Var : C / »
A=1
B=0
C=0
  
```

(Note: You may find that your current window settings do not show as complete a picture of the animation as you would like. To change them, type **[AC/ON] [EXIT] [SHIFT]-[F3]** (V-WIN). Recommended window settings for this animation are $X_{min} = -5$, $X_{max} = 5$, $Y_{min} = -5$, $Y_{max} = 8$.)

```

View Window
Xmin  :-5
max   : 5
scale : 1
dot   : 0.07936507
Ymin  :-5
max   : 8
  
```

The vertex form of a quadratic function is also stored as a Built-In function. Return to the Dynamic Function screen, then press **[F5]** (B-IN) and select the second function from the top:
 $Y=A(X-B)^2+C$. You may find this to be a good way to introduce the idea of horizontal shift to your students.

```

Y=AX+B
Y=A(X-B)^2+C
Y=AX^2+BX+C
Y=AX^3+BX^2+CX+D
Y=Asin (BX+C)
Y=Acos (BX+C)
Y=Atan (BX+C)
  
```

Exercise 1. Create a Dynamic Graph of the function $Y = AX^2 + BX + C$, animating on the value of B, that causes the outermost parabolas to exactly touch the upper left and upper right corners of a Standard (STD) viewing window. Use the values $A=2.5$ and $C=0$ for the other variables.

Exercise 2. Select C as the Dynamic Variable, and set the values of A and B to be zero. Explain why no parabolas are generated in the resulting animation.

