

# Transformation Graphing

## CATEGORY

Graphing mode

## DESCRIPTION

Transformation allows visualizing dynamically how changes in a function's parameters affect its graph.



## DIDACTICAL SUGGESTIONS

This application enables students to discover several properties in terms of a function's parameters: roots, increasing and decreasing, symmetry, period, ... It can also be used for modeling by manipulating coefficients to fit equations to data points.

Transformation Graphing is an application that once it's started it keeps running in the background. It changes the Y= window as follows and adds the SETTINGS menu to the WINDOW screen.

```
Plot1 Plot2 Plot3
MY1=
MY2=
MY3=
MY4=
MY5=
MY6=
MY7=
```

```
WINDOW SETTINGS
Xmin=-10
Xmax=10
Xscl=1
Ymin=-10
Ymax=10
Yscl=1
Xres=3
```

```
WINDOW SETTINGS
>|| > >>
A=.1
B=.2
C=.5
D=1
Step=1
```

To quit Transformation Graphing you need to activate it again in the APPS menu and then select 1: Uninstall. Note that it is not possible to run Transformation Graphing and Inequality Graphing (3.9) at the same time.

```
TRANSFORM APPS
1:Uninstall
2:Continue
```

With Transformation Graphing is possible to observe the effects of changing parameter values on the graph without leaving the graph screen. It is only available in the function mode and when it's active it's only possible to plot one function.

Transformation Graphing allows the use of four parameters: A, B, C, and D. All the others act like constants, using the value in the RAM memory.

Transformation Graphing has three play types.

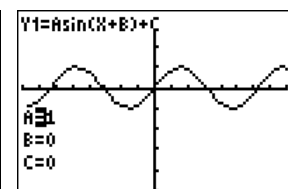
- PLAY-PAUSE (>||) lets you change the parameter and plot the graph.
- PLAY (>) stores a series of changes and shows the corresponding graphs in a continuous slide show.
- PLAY-FAST (>>) stores a series of changes and shows the corresponding graphs in a fast continuous slide show.

We will use the function  $f(x) = A\sin(Bx) + C$  to illustrate how Transformation Graphing works. We will start with the following WINDOW settings.

```
Plot1 Plot2 Plot3
MY1: A sin(X+B)+C
MY2=
MY3=
MY4=
MY5=
MY6=
MY7=
```

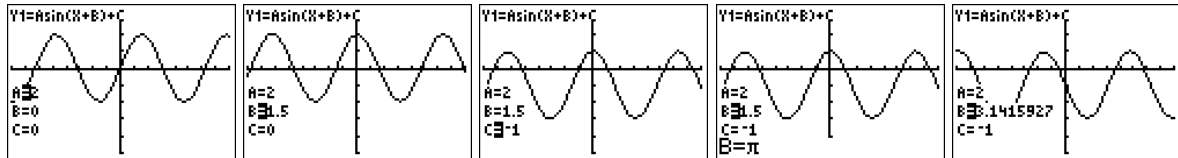
```
WINDOW SETTINGS
Xmin=-8
Xmax=8
Xscl=1
Ymin=-5
Ymax=3.5
Yscl=1
Xres=3
```

```
WINDOW SETTINGS
>|| > >>
A=.1
B=0
C=0
Step=.5
```



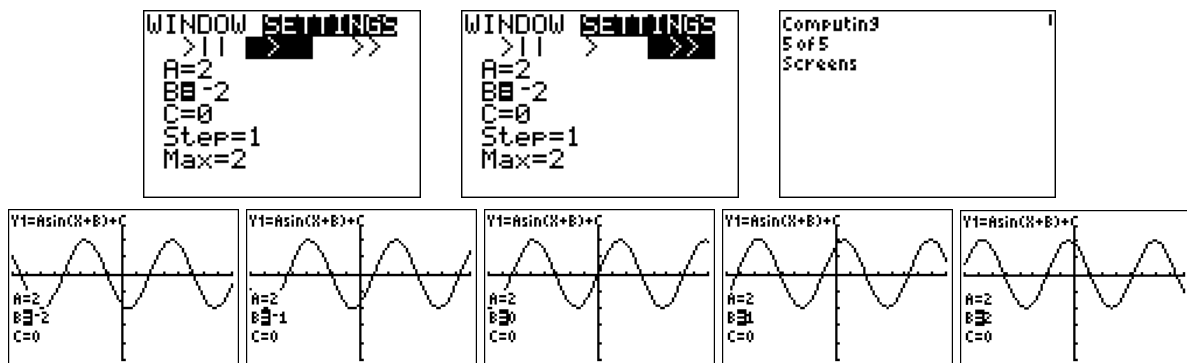
### PLAY-PAUSE (>||)

Press  $\leftarrow$   $\rightarrow$  to change the selected parameter and  $\blacktriangle$   $\blacktriangledown$  to select a different parameter. The graph will change automatically. It is also possible to enter a value manually. Select the parameter, enter the value and press ENTER.



### PLAY (>) and PLAY-FAST (>>)

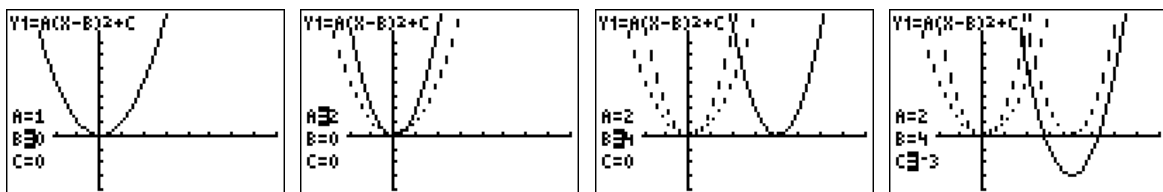
With these options you can define a slide show per parameter. By putting the cursor on the equality sign and pressing enter you can select another parameter. Press [GRAPH] to start generating the screens for the slide show. The definitions below will generate 5 screens for the parameter B: from -2 to 2 in steps of size 1.



Press ENTER to pause the show and again to resume it and press and hold ON to stop.

Transformation Graphing also adds an extra setting to the graph format screen,  $2\text{nd}[\text{FORMAT}]: \text{TrailOff}$  or  $\text{TrailOn}$ .

With  $\text{TrailOn}$  you will see better the effect of changing a parameter because the previous graphs stay on the screen in a dotted format.



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### POINT OF VIEW

Transformation graphing is a dynamical tool with which students can independently discover properties of real functions by means of a graphical approach. It will give the students a better and deeper insight.