EXPLORATIONS ™

Activity 8

Objective

- Recognize the effects of changes in parameters on the graphs of linear, quadratic, and exponential functions

Wrapping It All Up

Introduction

The seven previous activities have provided investigations for the linear, quadratic, and exponential functions. Each activity was designed as an investigation for just one function.

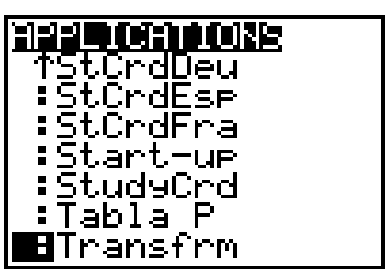
In this activity you will work with all three functions that have been studied to review the effects of the various parameters on the graphs of these functions.

Activity Set Up

This activity contains four sections, each of which is set up by running a program. The four programs are contained in a group named **TRANS8**. This program can be found on the TI Web site at **education.ti.com**. Click on **activities**, click on **activity books**, and then select the book *Exploring Mathematics with the Transformation Graphing Application*. See Appendix A for instructions on downloading apps or programs from your computer to your graphing handheld.

1. Load **TRANS8** to your graphing handheld.

2. Press [APPS] and select **Transfrm**. Press any key (except [2nd] or [ALPHA]) to start the Transformation Graphing App.



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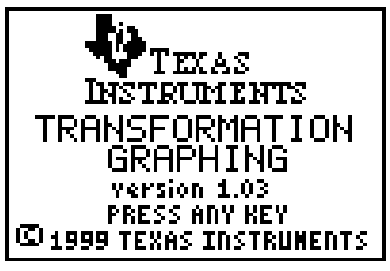
Note: *If you do not see the screen shown, select* **Continue**.



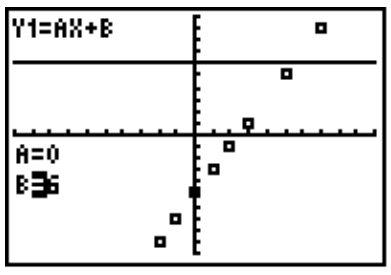
Linear Practice

1. Start the program **HITLINE** by pressing PRGM and using ▼ to highlight **HITLINE**. Press ENTER to paste the program name to the home screen and then press ENTER to start it.

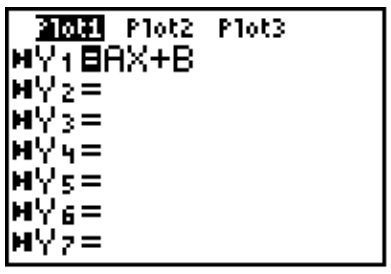
2. A line $y = ax + b$ is graphed with $A = 0$ and $B = 6$. A linear scatter plot is displayed. Highlight **A=** and **B=** to change their values so that the line model matches the data in the scatter plot.

   Write an equation for the line model that matches the scatter plot.

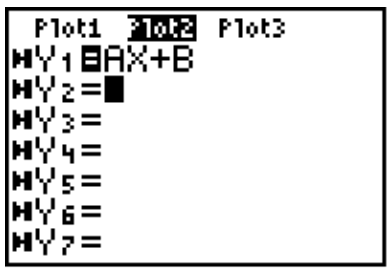
   $y =$ _____



3. Press Y=. Press ▲ to select **Plot1**. Press ENTER to turn off the first plot.



4. Press ▶ to highlight **Plot2**. Press ENTER to select the second plot.



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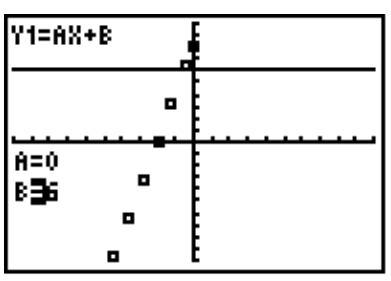
5. Press GRAPH to display the second plot. Change the values for *A* and *B* until you have a good model for the second data set.

Write an equation for the second model.

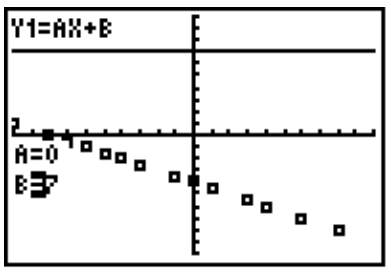
y = _____



6. Press Y= again. De-select **Plot2** and select **Plot3**. Then press GRAPH.

Write an equation for the model of the third data set.

y = _____



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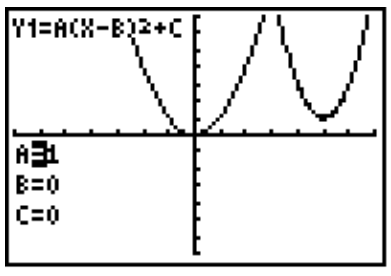
Quadratic Practice

Using the same steps as in the previous section, run program **HITQUAD**. Like program **HITLINE**, program **HITQUAD** will display the graphs of three quadratic functions. Using the Transformation Graphing App, you can match each of the three graphs with an equation in vertex form, $y = a(x - b)^2 + c$. As you find each equation, follow steps **3–5** in the Linear Practice section to display the different graphs.

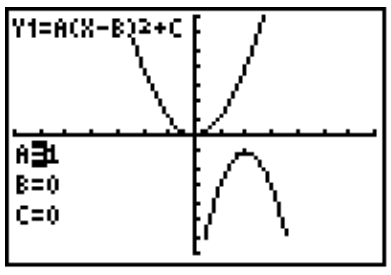
1. Write an equation for the model that matches the first graph.

$y =$ _____



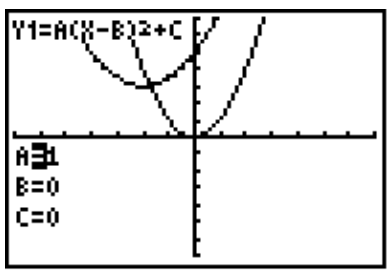
2. Write an equation for the model that matches the second graph.

$y =$ _____



3. Write an equation for the model that matches the third graph.

$y =$ _____



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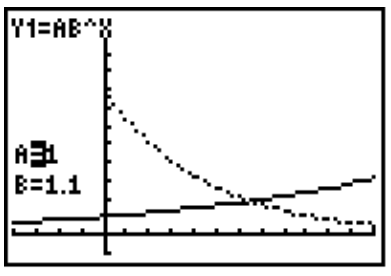
Exponential Practice

Using the same steps as in the previous two sections, run program **HITEXP**. Like the other two programs, **HITEXP** will display three scatter plots that can be modeled by an exponential function. Using the Transformation Graphing App, you want to match each of the three plots with an exponential equation in $y = ab^x$ form. As you find each equation, follow steps **3–5** in the Linear Practice section to display a new plot.

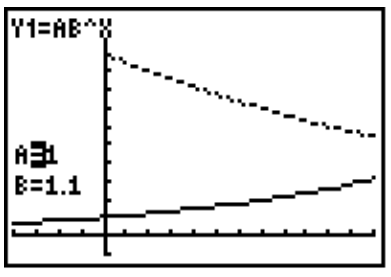
1. Write an equation for the model that matches the first graph.

$y =$ _____



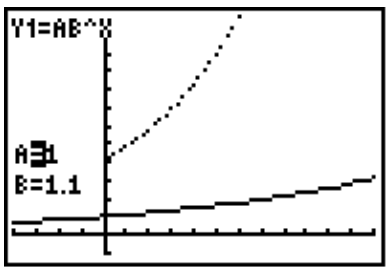
2. Write an equation for the model that matches the second graph.

$y =$ _____



3. Write an equation for the model that matches the third graph.

$y =$ _____



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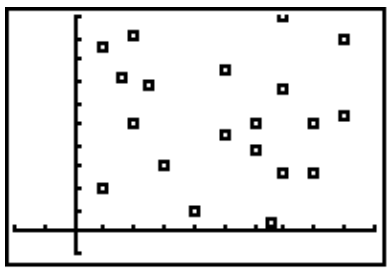
Student Worksheet

Name _____

Date _____

Now that you have practiced with each of the linear, quadratic, and exponential functions individually, it is time to give you a challenge exercise.

1. Run program **HITALL**. This program will plot 20 points in the first quadrant.

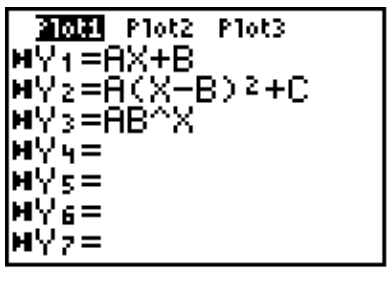


2. It also places the following equations in the **Y=** editor.

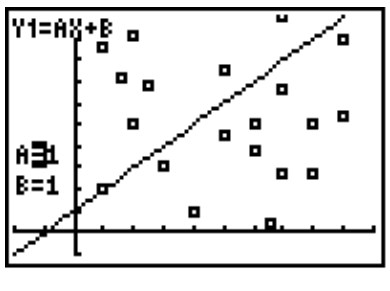
   Y1=AX+B

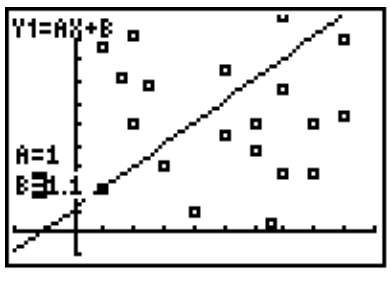
   Y2=A(X–B)^2+C

   Y3=AB^X



Your task is to try to get the line, parabola, or exponential function to "hit" as many points as possible by changing the values of *A*, *B*, and *C*. To "hit" a point the line, parabola, or exponential must shade in the center of the square that locates the point. The screenshot on the left shows a line that hits no points. The screenshot on the right "hits" one point.





The line will be active when program **HITALL** is executed.

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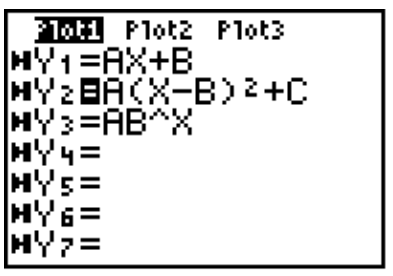
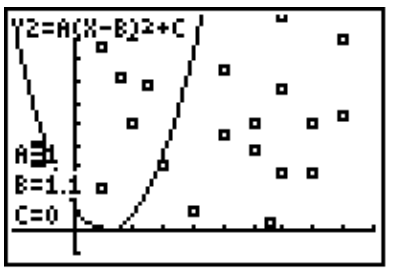
3. To change to a different function press [Y=] and highlight the = sign for the function you want to use. When the appropriate = is highlighted, press [ENTER].



4. Press [GRAPH] to display the new function with the scatter plot.



When you have "hit" as many points as possible with a function, complete the table.

Equation	Your values	Number of points "hit"
Y1=AX+B	*A* = _____ *B* = _____	
Y2=A(X–B)^2+C	*A* = _____ *B* = _____ *C* = _____	
Y3=AB^X	*A* = _____ *B* = _____	

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Teacher Notes

Activity 8

Wrapping It All Up

Objective

- Recognize the effects of changes in parameters on the graphs of linear, quadratic, and exponential functions

Materials

- TI-84 Plus/TI-83 Plus
- TRANS8 program for the handheld
- TI Connect™ Software
- TI Connectivity Cable

Time

- 60 minutes

This activity is meant as a review of the functions that have been studied in this activity book. The Transformation Graphing application provides an easy, visual, interactive method for students to investigate the effects of changes in the parameters of a function on its graph. While each of the previous activities was centered on a particular function (linear, quadratic, exponential) that would be studied in Algebra 1 or Algebra 2, this activity allows the students to look back at all of them.

The first three investigations of this activity are function-specific, with the fourth providing practice with the preceding three. The fourth investigation also provides a more casual simulation that students may find more engaging and game-like than the previous investigations. This activity would be appropriate for students in Algebra 2 or as a review in more advanced math courses.

Be sure the students are comfortable changing scatter plots for the first three investigations of the activity and then changing equations during the fourth section. Students will frequently forget to turn off the previous plots that have been used in sections **1–3**. This concern does not apply to the Student Worksheet activity, as the Transformation Graphing App will allow only one function to be graphed at a time.

To do these four investigations, students need the four programs, **HITALL**, **HITEXP**, **HITLINE**, and **HITQUAD**. These programs are very easy to run and do not require much knowledge of graphing handhelds on the students' part. The only mistakes that students might make involve forgetting to change the plots or equations as mentioned above.

Each investigation of this activity is intended to be an independent activity for the students. They will be able to determine if their answers are correct for sections **1–3**. Students may become competitive on the final section trying to "hit" more points than their classmates.

Remind your students to deactivate the Transformation Graphing App once they have finished the activities.

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Answers

Linear Practice

2. $y = 2x - 5$

5. $y = 4x + 8$

6. $y = {}^{-}0.5x - 4$

Quadratic Practice

1. $y = 2(x - 5)^2 + 1$

2. $y = {}^{-}2(x - 2)^2 - 1$

3. $y = 0.5(x - 2)^2 + 3$

Exponential Practice

1. $y = 8(0.8)^x$

2. $y = 10(0.95)^x$

3. $y = 4(1.2)^x$

Student Worksheet

Answers may vary. Sample answers are:

Equation	Your values			Number of points "hit"
Y1=AX+B	$A = {}^{-}0.5$	$B = 10$		4
Y2=A(X–B)^2+C	$A = 1$	$B = 4$	$C = 1$	5
Y3=AB^X	$A = 10$	$B = 0.85$		5

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