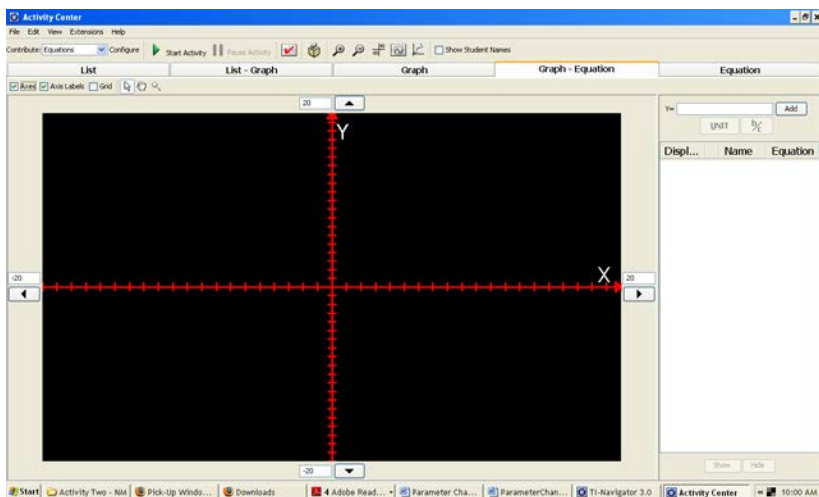


## Parameter Changes in Quadratic Functions Teacher Notes

Distribute the handout *ParameterChangesQuadraticFunctionsStudent.doc* to students. Students can work individually or in pairs on the handout. Supervise the students and assist them in arriving at the correct conclusions. Allow 15 – 20 minutes for students to complete the handout.

Start TI-Navigator and load the file *ParamQuads.act*. Quick Poll and Activity Center will be used as an informal assessment tool.

On TI-Navigator begin class and have students log in. In Activity Center make sure that the Graph-Equation tab is selected.

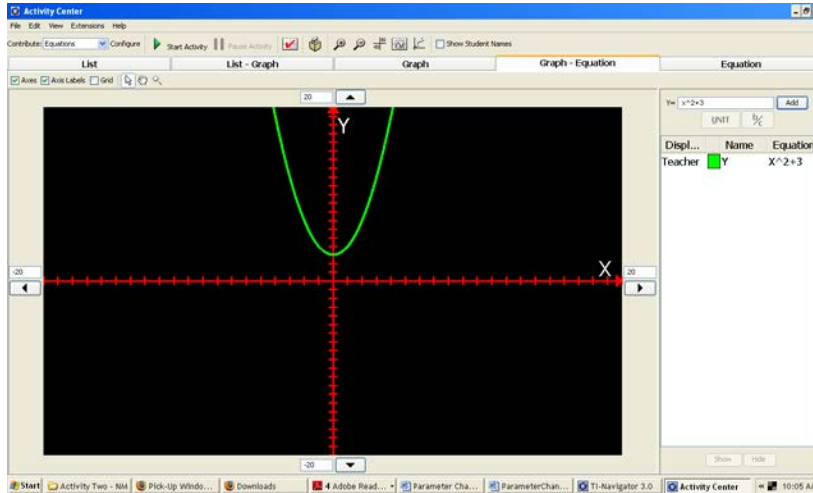


The activity is as follows.

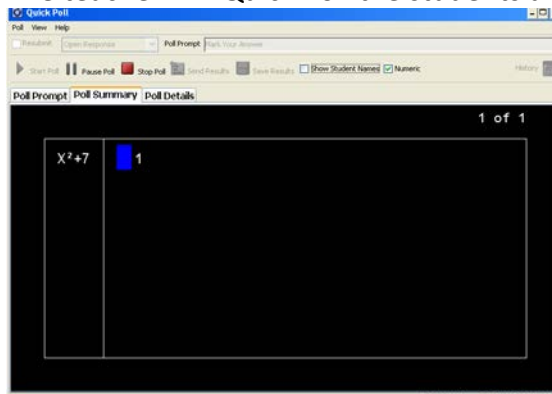
1. The teacher will graph an equation in Activity Center.
2. The teacher will describe physical changes to the graph.
3. The teacher will Quick Poll the students and asks for their prediction on the equation of the graph.
4. The teacher will start the activity and have students submit their equations. After all or most students have submitted their equation, stop the activity and reveal the correct equation.

Example:

1. Teacher graphs  $y = x^2 + 3$ .



2. The teacher will describe physical changes to the graph  
*If the graph of the function is shifted 4 units up, which equation best represents the translation?*
3. The teacher will Quick Poll the students and asks for their prediction.



4. The teacher will start the activity and have students submit their equations.

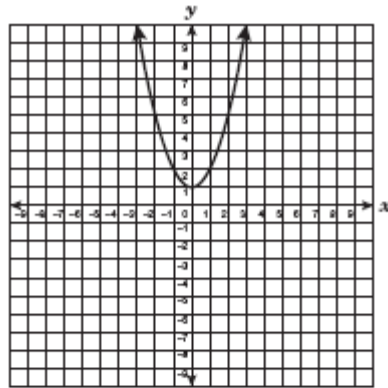
Repeat the activity with different equations and parameter changes.

Some examples:

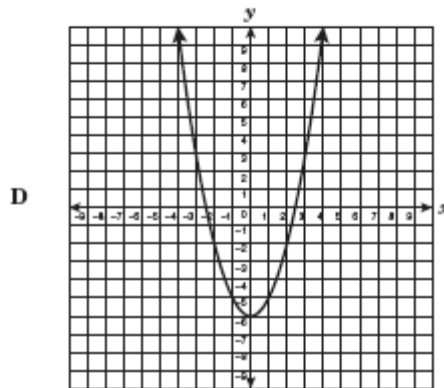
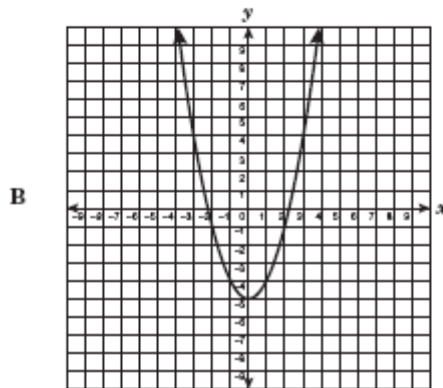
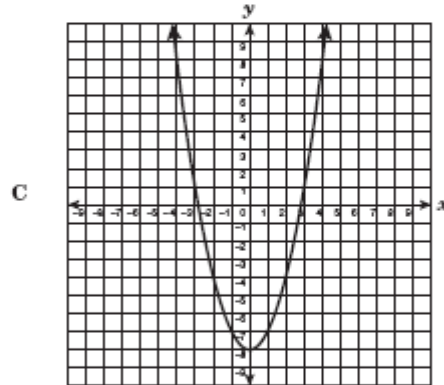
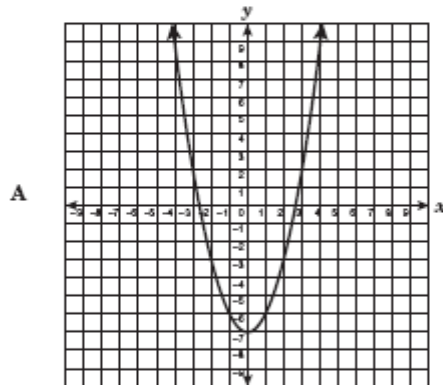
Equation	Change Description
$Y = (x-3)^2$	The graph of the function is shifted 3 units up and 2 units to the left.
$Y = (x+2)^2 + 3$	The graph of the function is shifted 2 units down.
$Y = -(x-1)^2$	The graph of the function is inverted and is 3 times wider than the original

Below are some problems that assess these skills.

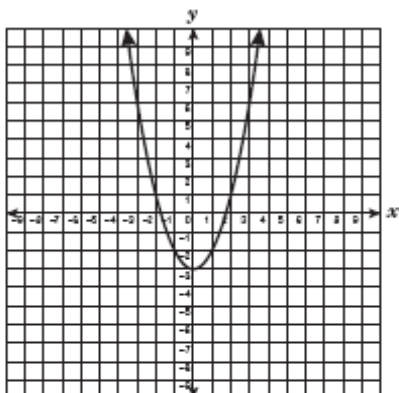
- 1 The graph of a function is shown below.



If the graph is translated 7 units down, which of the following best represents the resulting graph?



- 46 The graph of the function  $y = x^2 - 3$  is shown below.



If the graph of the original function is shifted 5 units up, which of the following equations best represents the translation of each point on the curve?

F  $y = x^2 + 5$

G  $y = x^2 + 2$

H  $y = x^2 - 2$

J  $y = x^2 - 8$

- 18 Shirley graphed a function of the form  $y = ax^2 + c$ . She then translated the graph 8 units up, resulting in the function  $y = -\frac{2}{3}x^2 + 5$ . Which of the following best represents Shirley's original function?

F  $y = -\frac{2}{3}x^2 + 13$

G  $y = -\frac{2}{3}x^2 - 13$

H  $y = -\frac{2}{3}x^2 + 3$

J  $y = -\frac{2}{3}x^2 - 3$

- 7 Which quadratic function has a vertex below the origin and opens upward?

A  $y = -x^2 + 3$

B  $y = -x^2 - 1$

C  $y = x^2 + 5$

D  $y = x^2 - 2$

- 23 Which of the following does not describe the graph of the parent function of a quadratic equation?
- A The graph has its vertex at the origin.
  - B The graph is a parabola that opens upward.
  - C The graph has the  $x$ -axis as its line of symmetry.
  - D The graph has a minimum value at  $(0, 0)$ .
- 44 The formula for the volume of a cylinder with a height of 5 units can be represented as  $y = 5\pi x^2$ , where  $x$  represents the radius. If the cylinder's height is tripled, what is the effect on the graph of  $y$  as a function of  $x$ ?
- F The graph is translated up.
  - G The graph remains the same.
  - H The graph becomes narrower.
  - J The graph becomes wider.
- 57 Which graph best represents the equation  $y = 2x^2 + 1$ ?

