

Transformations

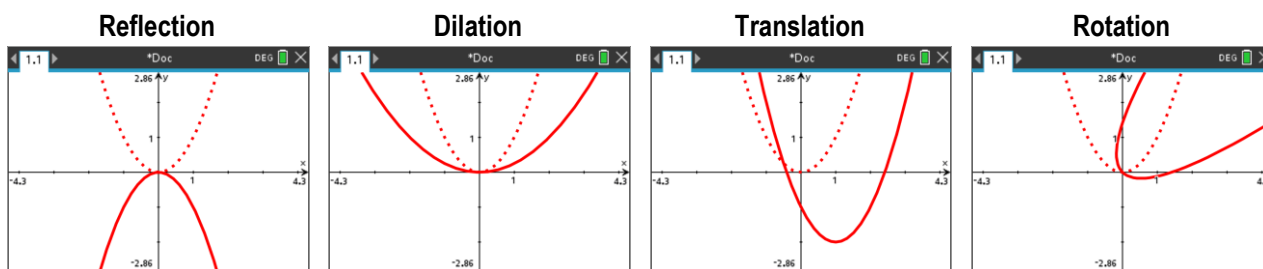
Student Investigation

7 8 9 10 11 12



Introduction

Transformation means a change in form or appearance. Common transformations when dealing with functions include:



The aim of this activity is to provide an understanding of the algebra underpinning transformations. The technique involves the consideration of a single point and the effect it has on the general form or appearance of an entire family of points defined by a rule or function. A video tutorial is available to help set up your TI-Nspire file.



<https://bit.ly/TI-transformations>

Set up

Open your “Transformations” document created using the video link above.

Point $P(x_1, y_1)$ is on the parabola: $f_1(x) = x^2$

Point P has undergone a transformation such that:

$$P'(x', y') \text{ such that: } x' = 2x_1 \text{ and } y' = y_1$$

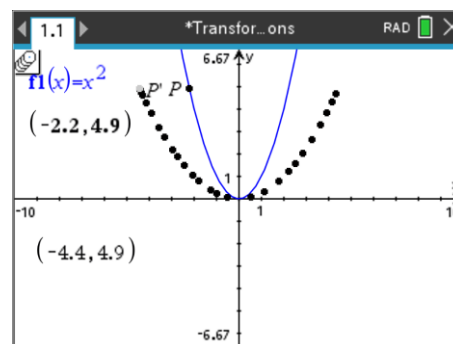
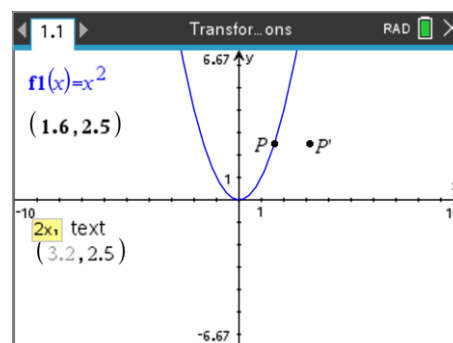
The text tip on P' provides the transformation details.

Edit the transformation for your point P' to match these conditions.

Drag point P along the parabola and observe the coordinates of P'.

Point P' is described as a dilation, “parallel to the x axis” or “away from the y axis” by a factor of 2.

In the screen opposite, the path of point P' has been traced using the Trace (Geometry) tool.



Determining Equations

Question 1.

- Given $x' = 2x$, $y' = y$ and $y = x^2$, determine the relationship between x' and y' . Check your answer using your calculator and the corresponding transformation tools on the calculator.
- Based on your answer to the previous question, describe the transformation from $y = x^2$ to $y = 4x^2$. Test your answer using your calculator and the transformations file.

Question 2.

Edit the transformation for point P' such that: $x' = x + 2$ and $y' = y$

- Describe the location of point P' in relation to P .
- Determine the equation for the path of point P' .

Question 3.

Edit the transformation for point P' such that: $x' = x$ and $y' = y - 3$

- Describe the location of point P' in relation to P .
- Determine the equation for the path of point P' .

Question 4.

Point P is dilated by a factor of 3 away from the x axis, then translated 2 units in the negative x direction. Use your calculator to observe the path of point P' and determine the equation for $P'(x', y')$.

Question 5.

Point P is translated by 2 units in the negative x direction, then dilated by a factor of 3 away from the x axis. Use your calculator to observe the path of point P' and determine the equation for $P'(x', y')$.

Question 6.

Based on your answers to Questions 4 and 5, does the order of transformations matter?

Question 7.

$P(x, y)$ is transformed such that $x' = x$ and $y' = 2y$, use your calculator to observe the path of point P' .

- Determine the equation for $P'(x', y')$.
- Write an equivalent transformation, based on your equation in part (a).

Question 8.

$P(x, y)$ is transformed such that $x' = x - 3$ and $y' = -y$, use your calculator to observe the path of point P' .

- Determine the equation for $P'(x', y')$.
- State the corresponding transformations.