

Exploring Rational Functions Using Transformations

Graph the parent function $y_1 = \frac{1}{x}$. Make a sketch on your record sheet.

Describe what happens to the graph as x approaches the origin.

Describe what happens to the graph as x moves away from the origin.

Describe its two asymptotes:

Create a table of value for this function.

Experiment 1:

Graph $y_2 = \frac{2}{x}$. Add this picture to your graph.

Add a set of table values for y_2 .

Describe how the graph has changed.

Graph $y_3 = \frac{4}{x}$. Add this picture to your graph.

Add a set of table values for y_3 .

Describe how the graph has changed.

Describe what happens to the function $y = 1/x$ when it is transformed to $y = k/x$ where $k > 1$.

Graph $y_4 = -\frac{2}{x}$. Add this picture to your

graph. Add a set of table values for y_4 .

Describe how the graph has changed.

Graph $y_5 = -\frac{4}{x}$. Add this picture to your

graph. Add a set of table values for y_5 .

Describe how the graph has changed.

Describe what happens to the function $y = 1/x$ when it is transformed to $y = k/x$ where $k < -1$.

Do the asymptotes change when the function is changed to $y = \frac{k}{x}$? Describe how the table values are

changed for the new functions of the form $y = \frac{k}{x}$.

Experiment 2:

Re-graph the parent function $y_1 = \frac{1}{x}$ on the

second coordinate axes on your record sheet.

Re-enter the table values for y_1 .

Graph $y_2 = \frac{1}{x-2}$. Add this picture to your

graph. Add a set of table values for y_2 . Describe how the graph has changed.

Graph $y_3 = \frac{1}{x-4}$. Add this picture to your

graph. Add a set of table values for y_3 . Describe how the graph has changed.

Describe what happens to the function $y = \frac{1}{x}$

when it is transformed to $y = \frac{1}{x-h}$ where $h > 0$.

Graph $y_4 = \frac{1}{x+1}$. Add this picture to your

graph. Add a set of table values for y_4 . Describe how the graph has changed.

Graph $y_5 = \frac{1}{x+4}$. Add this picture to your

graph. Add a set of table values for y_5 . Describe how the graph has changed.

Describe what happens to the function $y = \frac{1}{x}$

when it is transformed to $y = \frac{1}{x-h}$ here

$h < 0$. Do the asymptotes change when the

function is changed to $y = \frac{1}{x-h}$? Describe how

the table values are changed for the new

functions of the form $y = \frac{1}{x-h}$.

Experiment 3:

Re-graph the parent function $y1 = \frac{1}{x}$ on the third coordinate axes on your record sheet. Re-enter the table values for y1.

Graph $y2 = \frac{1}{x} + 2$. Add this picture to your graph. Add a set of table values for y2. Describe how the graph has changed.

Graph $y3 = \frac{1}{x} + 4$. Add this picture to your graph. Add a set of table values for y3. Describe how the graph has changed.

Describe what happens to the function $y = \frac{1}{x}$ when it is transformed to $y2 = \frac{1}{x} + k$ where $k > 0$.

Graph $y4 = \frac{1}{x} - 3$. Add this picture to your graph. Add a set of table values for y4. Describe how the graph has changed.

Graph $y5 = \frac{1}{x} - 5$. Add this picture to your graph. Add a set of table values for y5. Describe how the graph has changed.

Describe what happens to the function $y = \frac{1}{x}$ when it is transformed to $y2 = \frac{1}{x} + k$ where $k < 0$.

Experiment 4: Combining Transformations

Re-graph the parent function $y1 = \frac{1}{x}$ on the fourth coordinate axes on your record sheet. Re-enter the table values for y1.

Graph $y2 = \frac{2}{x-1}$. Add this picture to your graph. Add a set of table values for y2. Describe how the graph has changed.

Graph $y3 = \frac{1}{x+1} + 2$. Add this picture to your graph. Add a set of table values for y3. Describe how the graph has changed.

Graph $y4 = -\frac{2}{x+1} - 2$. Add this picture to your graph. Add a set of table values for y4. Describe how the graph has changed.

Suppose a function was given as $y = \frac{3}{x-2} + 1$. Describe how its graph is related to the graph of

$$y = \frac{1}{x}.$$