

Building Understanding for Rational Functions With Holes Through Graphing and Tables

Recall that equations of the form $y = \frac{1}{x}$ and $y = \frac{1}{x-1}$ have vertical and horizontal asymptotes. Let's explore some other rational functions:

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

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Suppose $y = \frac{x^2 - 2x + 1}{x-1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Suppose $y = \frac{x^2 + 4x + 3}{x+1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Suppose $y = \frac{x^2 + 3x - 4}{x+1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Summarize what you have learned from the last four examples. Why does each function have a hole in the function? How is the graph related to the simplified function?

Suppose $y = \frac{x^3 + x^2 + x + 2}{x + 1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Suppose $y = \frac{x^3 + x}{x + 1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Suppose $y = \frac{x^3 + 3x^2 + 2x}{x + 1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?

Suppose $y = \frac{-x^3 + x^2 + 2x}{x + 1}$

- Graph this function in a zoom 4 Decimal window. Trace along the graph to read some of the coordinates on the graph. Do you notice anything?
- Simplify this function algebraically. What does it equal? Are there any restrictions?
- Create a set of table values for this function. What does this table tell you?