Investigation of End Behavior

EndBehavior.tns

Name ______________________

Class ______________________

Exercise 1 – Cost per person for a pizza order

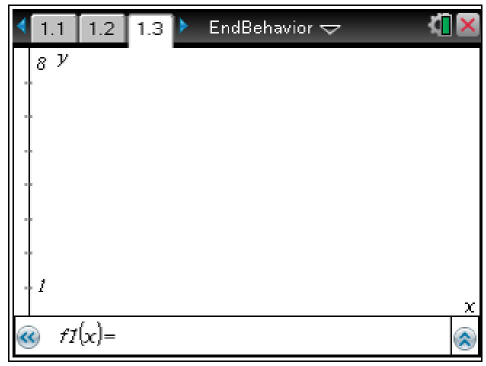
The coach of the football team wants to order individual pizzas to eat after their game. Pizza-To-Go charges $5 for each individual pizza, plus an overall delivery charge of $7. The coach needs to figure out the cost per player so that each player who wants pizza can contribute enough to cover the total cost.

- What do you think will happen to the cost per player for pizza as more team members decide they want to order pizza?

- Fill out the table on page 1.2. Is your prediction correct?

- Write a function for the cost per player.

- Graph your function as **f1**(x) on page 1.3. Sketch the graph on the coordinate grid to the right.



- As the number of players increases, what happens to the cost per player? What number does the cost per player approach? Explain what this means in the context of the problem.

Exercise 2 – Investigating end behavior

On page 2.1, you will see the graph of $\mathbf{f}(x) = \dfrac{2x+3}{x+1}$.

- Change the window so that the x-axis goes from –500 to 500. What happens to the graph?

Investigate the behavior of **f**(x) on page 2.2. On the *Calculator* screen, enter positive values of x that approach positive infinity by typing "**f**(" followed the value for x. In the spreadsheet, enter negative values of x that approach negative infinity in Column A.

- What value is **f**(x) approaching as x approaches positive or negative infinity?

- How is this supported by your graph? What can you see in the equation that might support your thinking? Explain.

The graph of $\mathbf{g}(x) = \dfrac{-6x-1}{3x+4}$ is displayed on page 3.1.

- Extend the axes of the graph as before. What do you notice?

Investigate the behavior of **g**(*x*) on page 3.2. Choose several values of *x* to explore.

- What value is **g**(*x*) approaching as *x* approaches infinity?

- How is this supported by your graph? What can you see in the equation that might support your thinking? Explain.

On page 4.1, the graph of $\mathbf{h}(x) = \dfrac{x+3}{x^2+1}$ is shown.

- Adjust the window as done in previous exercises. What do you observe?

Investigate the behavior of **h**(*x*) on page 4.2 as before.

- What is the end behavior of **h**(*x*)? How is this supported by your graph? What can you see in the equation that might support your thinking? Explain.

The graph of $\mathbf{j}(x) = \dfrac{10x+2}{x-6}$ appears on page 5.1.

Use the table to investigate the values of **j** as *x* gets larger and smaller.

- What is the end behavior of **j**(*x*)? Explain.

On page 5.2, the graph of $\mathbf{k}(x) = \dfrac{x+3}{2x-1}$ is displayed.

Again, use the table to investigate the values.

- What is the end behavior of **k**(*x*)? Explain.

The graph of $\mathbf{m}(x) = \dfrac{x+5}{2x^2+2}$ appears on page 5.3.

Use the calculator to investigate the values of **m** as *x* gets larger and smaller.

- What is the end behavior of **m**(*x*)? Explain.

Bringing it all together

- Summarize how you to find the end behavior of a rational function on a graph. How about on a table? What is end behavior in your own words?

Recall the end behavior of the following functions from this activity:

- $f1(x) = \dfrac{5x+7}{x}$ end behavior: y = ____
- $f(x) = \dfrac{2x+3}{x+1}$ end behavior: y = ____
- $g(x) = \dfrac{-6x-1}{3x+4}$ end behavior: y = ____
- $j(x) = \dfrac{10x+2}{x-6}$ end behavior: y = ____
- $k(x) = \dfrac{x+3}{2x-1}$ end behavior: y = ____

- Based on what you observe in the above examples, what do you think is the end behavior of the function $f(x) = \dfrac{8x-1}{2x+3}$?

- What is the end behavior of a rational function of the form $f(x) = \dfrac{ax+b}{cx+d}$ where b and d are any integer and a and c are any nonzero integers?

Extension

Examine the end behavior of the function shown on page 6.1. Then explore changing the definition of **f1**(x) and dragging and rotating the line given by **f2**(x).

