Classroom Project: Section 3.5
Rational Functions and Their Graphs

Complete this project before Section 3.5 is covered.

Group size: 2–3
Materials: Paper, Pencil, Calculator
Time: 15–20 minutes

The group should explore the functions $f(x) = \frac{1}{x+5}$, $g(x) = \frac{x}{x+5}$, and $h(x) = \frac{x^2}{x+5}$ by completing the following.

1. Use a calculator to fill in the following tables for each of the functions. Round to three decimal places, where necessary.

x	1	5	10	20	30	40	50	75
f(*x*)								

x	1	5	10	20	30	40	50	75
g(*x*)								

x	1	5	10	20	30	40	50	75
h(*x*)								

2. Which function has output values that get smaller as *x* gets larger? For this function, use trial and error and your calculator to find a value of *x* that has an output value less than 0.0001.

3. Which function has output values that increase rapidly as *x* gets larger? For this function, use trial and error and your calculator to find a value of *x* that has an output value greater than 1000.

4. Which function has output values that increase slowly as *x* gets larger? For this function, use trial and error and your calculator to find a value of *x* that has an output value greater than 0.995.

5. Match of each of the functions *f*, *g*, and *h* to the appropriate description.

   a. As *x* increases, the function values decrease but are bounded below by 0.
   b. As *x* increases, the function values increase but are bounded above by 1.
   c. As *x* increases, the function values increase without bound.

6. The functions *f*, *g*, and *h* all have the same denominator. Can you explain the descriptions in #5 in terms of the numerators?

7. Write descriptions similar to the ones given in #5 for each of the following functions. Trial and error and your calculator may be helpful.

   a. $R(x) = \frac{2x}{x+3}$ b. $F(x) = \frac{x^3}{x+3}$ c. $r(x) = \frac{5}{x+3}$