EXPLORE Rational Functions

Given: $f(x) = \dfrac{x^2-4}{x^2-x-6}$

1. What is the domain of f(x)?
   All reals except . . .

2. Graph f(x) in a friendly viewing rectangle (TI-81: [-4.7,4.8] by [-5,5]; TI-82/83: [-4.7,4.7] by [-5,5]; TI-85 [-6.3,6.3] by [-5,5].

TRACE the graph from left to right across the screen. Where is f(x) undefined?

Describe what happens to the graph of f(x) at each x-value for which f(x) is undefined:

3. A **vertical asymptote** occurs at a place on a graph where the function is undefined and the graph grows towards positive or negative infinity on each side of the undefined point. Does f(x) have a vertical asymptote? Where?

4. A **hole** occurs where f(x) is undefined at a single point, but the graph would be continuous if that single point was not missing. Does f(x) have a hole in its graph? Where?

5. Write f(x) in factored form: f(x) =

(a) How could you use the equation of f(x) to predict where a vertical asymptote will occur in the graph?

(b) How could you use the equation of f(x) to predict where a hole will occur in the graph?

6. **TRACE** the graph of f(x) to the right beyond the current viewing rectangle. Continue to trace to the right for awhile. What seems to happen to the y-coordinates as x gets large?

7. **TRACE** the graph of f(x) to the left beyond the current viewing rectangle. Continue to trace to the left for awhile. What seems to happen to the y-coordinates as x gets small?

8. What is the end-behavior of the graph of f(x)?