

EXPLORE Rational Functions

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

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 $f(x)$?