EXAMPLE 2 Graph a rational function ($m = n$)

Graph $y = \frac{2x^2}{x^2 - 9}$.

REVIEW ZEROS OF FUNCTIONS

For help with finding zeros of functions, see p. 252.

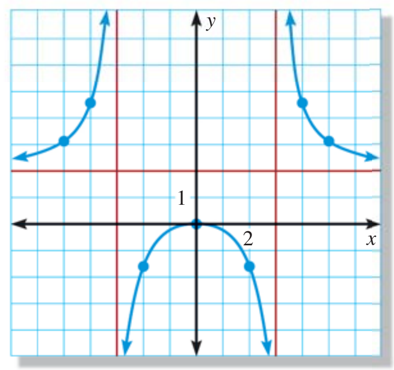
Solution

The zero of the numerator $2x^2$ is 0, so 0 is an x-intercept. The zeros of the denominator $x^2 - 9$ are ± 3, so $x = 3$ and $x = -3$ are vertical asymptotes.

The numerator and denominator have the same degree, so the horizontal asymptote is $y = \frac{a_m}{b_n} = \frac{2}{1} = 2$.

Plot points between and beyond the vertical asymptotes.

	x	y
To the left of $x = -3$	−5	3.1
	−4	4.6
Between $x = -3$ and $x = 3$	−2	−1.6
	0	0
	2	−1.6
To the right of $x = 3$	4	4.6
	5	3.1



EXAMPLE 3 Graph a rational function ($m > n$)

Graph $y = \frac{x^2 + 3x - 4}{x - 2}$.

Solution

The numerator factors as $(x + 4)(x - 1)$, so the x-intercepts are −4 and 1. The zero of the denominator $x - 2$ is 2, so $x = 2$ is a vertical asymptote.

The degree of the numerator, 2, is greater than the degree of the denominator, 1, so the graph has no horizontal asymptote. The graph has the same end behavior as the graph of $y = x^{2-1} = x$. Plot points on each side of the vertical asymptote.

	x	y
To the left of $x = 2$	−8	−3.6
	−4	0
	0	2
	1	0
To the right of $x = 2$	3	14
	4	12
	8	14
	12	17.6