

Section 2.6 Rational Functions

Objective: In this lesson you learned how to determine the domains of rational functions, find asymptotes of rational functions, and sketch the graphs of rational functions.

Course Number

Instructor

Date

Important Vocabulary

Define each term or concept.

Rational function

Vertical asymptote

Horizontal asymptote

Slant (or oblique) asymptote

I. Introduction (Page 184)

The domain of a rational function of x includes all real numbers except . . .

To find the domain of a rational function of x , . . .

What you should learn

How to find the domains of rational functions

Example 1: Find the domain of the function $f(x) = \frac{1}{x^2 - 9}$.

II. Horizontal and Vertical Asymptotes (Pages 185–186)

The notation “ $f(x) \rightarrow 5$ as $x \rightarrow \infty$ ” means . . .

Describe the end behavior of a rational function in relation to its horizontal asymptote.

What you should learn

How to find the horizontal and vertical asymptotes of graphs of rational functions

Let f be the rational function given by

$$f(x) = \frac{N(x)}{D(x)} = \frac{a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0}{b_m x^m + b_{m-1} x^{m-1} + \cdots + b_1 x + b_0}$$

where $N(x)$ and $D(x)$ have no common factors.

- 1) The graph of f has vertical asymptotes at _____
_____.
- 2) The graph of f has one or no horizontal asymptote determined by _____
_____.
 - a) If $n < m$, the graph of f has _____
_____.
 - b) If $n = m$, the graph of f has _____
_____.
 - c) If $n > m$, the graph of f has _____
_____.

Example 2: Find the asymptotes of the function

$$f(x) = \frac{2x - 1}{x^2 - x - 6}.$$

III. Analyzing Graphs of Rational Functions

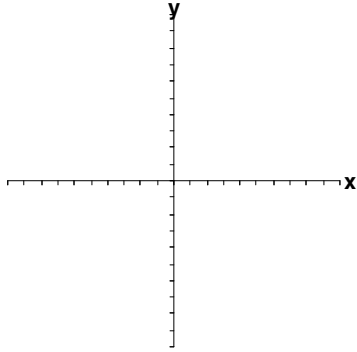
(Pages 187–189)

To sketch the graph of the rational function $f(x) = N(x)/D(x)$,

where $N(x)$ and $D(x)$ are polynomials with no common factors, . . .

What you should learn
How to analyze and sketch graphs of rational functions

Example 3: Sketch the graph of $f(x) = \frac{3x}{x+4}$.



IV. Slant Asymptotes (Page 190)

To find the equation of a slant asymptote, . . .

What you should learn
How to sketch graphs of rational functions that have slant asymptotes

Example 4: Decide whether each of the following rational functions has a slant asymptote. If so, find the equation of the slant asymptote.

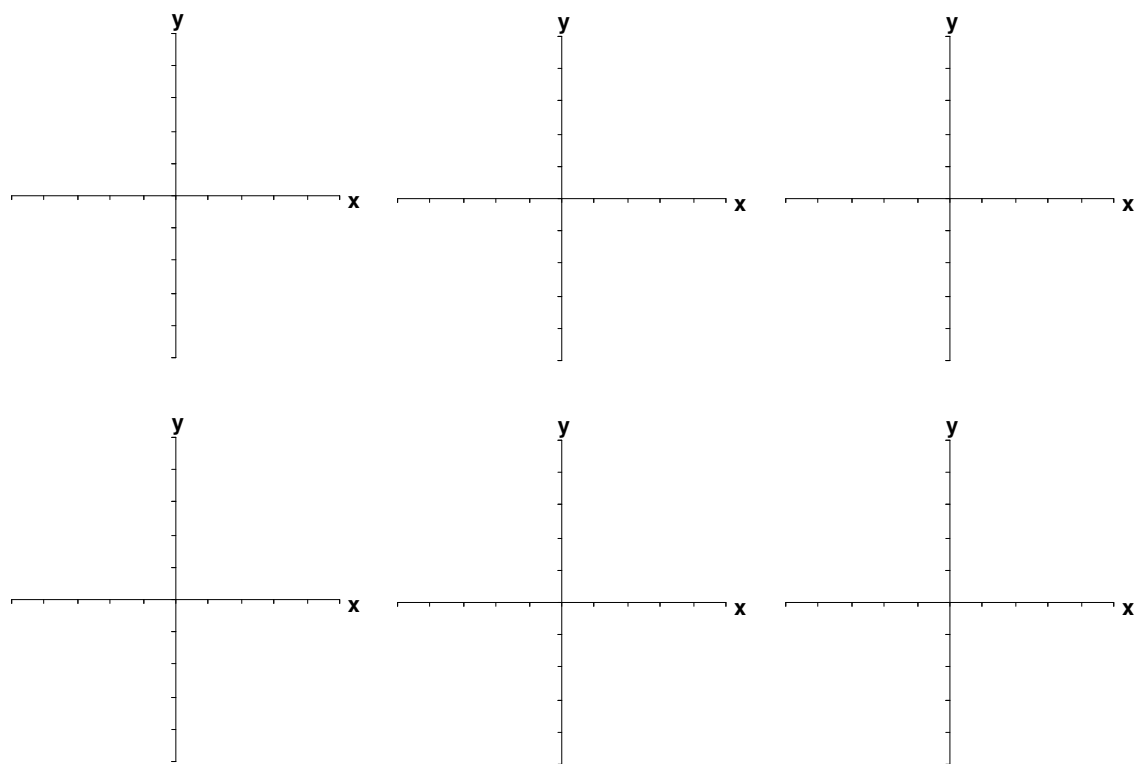
$$(a) f(x) = \frac{x^3 - 1}{x^2 + 3x + 5} \quad (b) f(x) = \frac{3x^3 + 2}{2x - 5}$$

V. Applications of Rational Functions (Pages 191–192)

Give an example of asymptotic behavior that occurs in real life.

What you should learn
How to use rational functions to model and solve real-life problems

Additional notes



Homework Assignment

Page(s)

Exercises