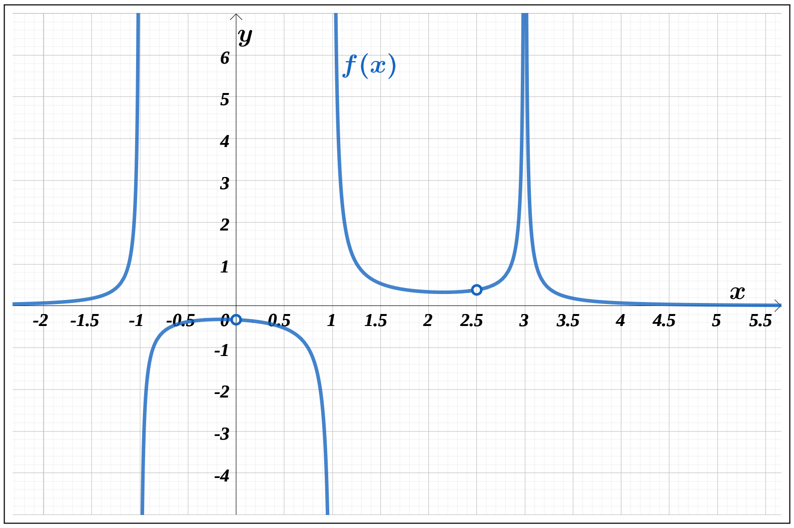
Sections 1.3 and 1.4

Problem 1. Use the graph below to find the vertical asymptotes and the x-values of any holes in the graph.



Problem 2. Find the following limits exactly. If the limit does not exist, use limit notation to describe any infinite behavior.

a. $\lim_{x\to\infty} \left(7x^4 + 14x^2 - x\right)$

b. $\lim_{x\to-\infty} \left(3x - 4x^9\right)$

c. $\lim_{x\to\infty} \left(8x^3 - 16x^6 + 11 - 4x\right)$

Problem 3. Find the following limits exactly. If the limit does not exist, use limit notation to describe any infinite behavior.

a. $\lim_{x \to \infty} \dfrac{x^2 - 1}{x^3 + 3x + 2}$

b. $\lim_{x \to -\infty} \dfrac{x^2 - x^4}{x - x^3}$

c. $\lim_{x \to -\infty} \dfrac{8x^3 - 22x}{4x^3 - 19}$

Problem 4. Find the horizontal asymptotes of $y = \dfrac{4e^{8x} + 12e^{4x} - 5}{-2e^{-2x} + 13e^{x}}$. Use limit notation to describe any infinite behavior.

Problem 5. Find the vertical asymptotes and the holes of $y = \dfrac{x^2 - 9}{x^2 + 4x + 3}$. For each vertical asymptote, use limit notation to describe the infinite behavior.

Problem 6. Find where the following functions are continuous algebraically. Write your answer in interval notation.

a. $y = x^2 + 13x - 1$

b. $g(x) = \dfrac{\sqrt{x-2}}{x-5}$

c. $h(x) = \ln(4-x) - \sqrt[3]{x+9}$

d. $f(x) = \begin{cases} 4x+4 & \text{if} \quad x \leq 3 \\ x^2+7 & \text{if} \quad x > 3 \end{cases}$

Problem 7. Algebraically determine the x-value(s) where $h(x)$ is discontinuous if

$$h(x) = \begin{cases} 4 - 2x & \text{if} \quad x \leq 1 \\ \dfrac{x^2 - 1}{x - 1} & \text{if} \quad 1 < x < 6 \\ \sqrt{x - 3} & \text{if} \quad x \geq 6 \end{cases}$$

Problem 8. Find the value(s) of k such that the function $f(x)$ is continuous at $x = -2$, where

$$f(x) = \begin{cases} -9 + kx & \text{if} \quad x \leq -2 \\ x^2 - 4 & \text{if} \quad x > -2 \end{cases}$$