Graphing Functions

Lecture 4
Section 1.2

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Objectives

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- Graph functions.
- Learn about intersections of graphs.
- Solve quadratic equations.
- Understand polynomials and rational functions.

The Graph of a Function

Definition (The Graph of a Function)

The **graph** of a function $f(x)$ is the set of points (x, y) in the plane for which $y = f(x)$.

Example

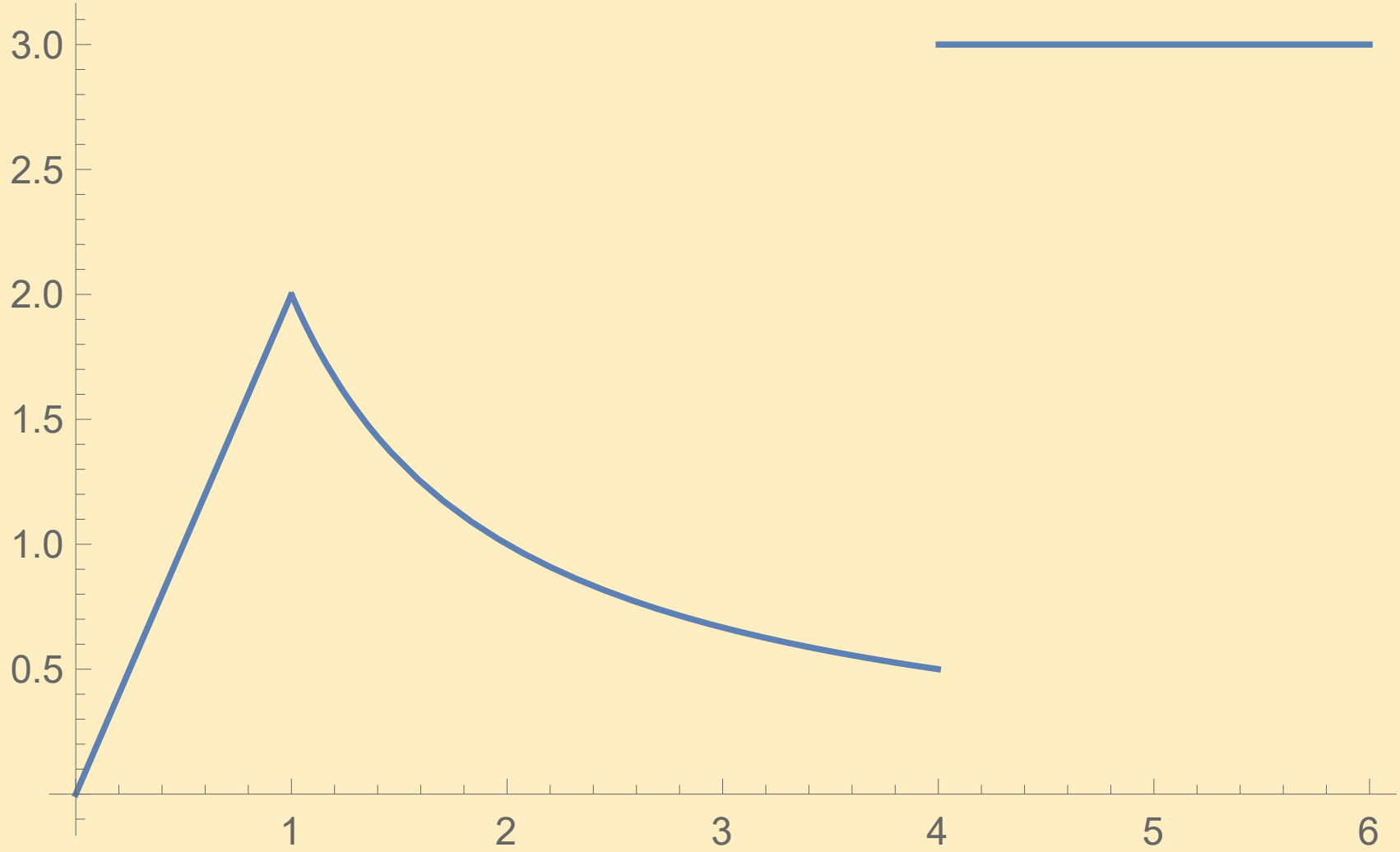
Example 1.2.3

Graph

$$f(x) = \begin{cases} 2x & \text{if } 0 \leq x < 1 \\ \frac{2}{x} & \text{if } 1 \leq x < 4 \\ 3 & \text{if } x \geq 4. \end{cases}$$

Example

Example 1.2.3



Intersection of Graphs

Intersection of Graphs

Let the supply function be

$$S(x) = 0.5x + 10$$

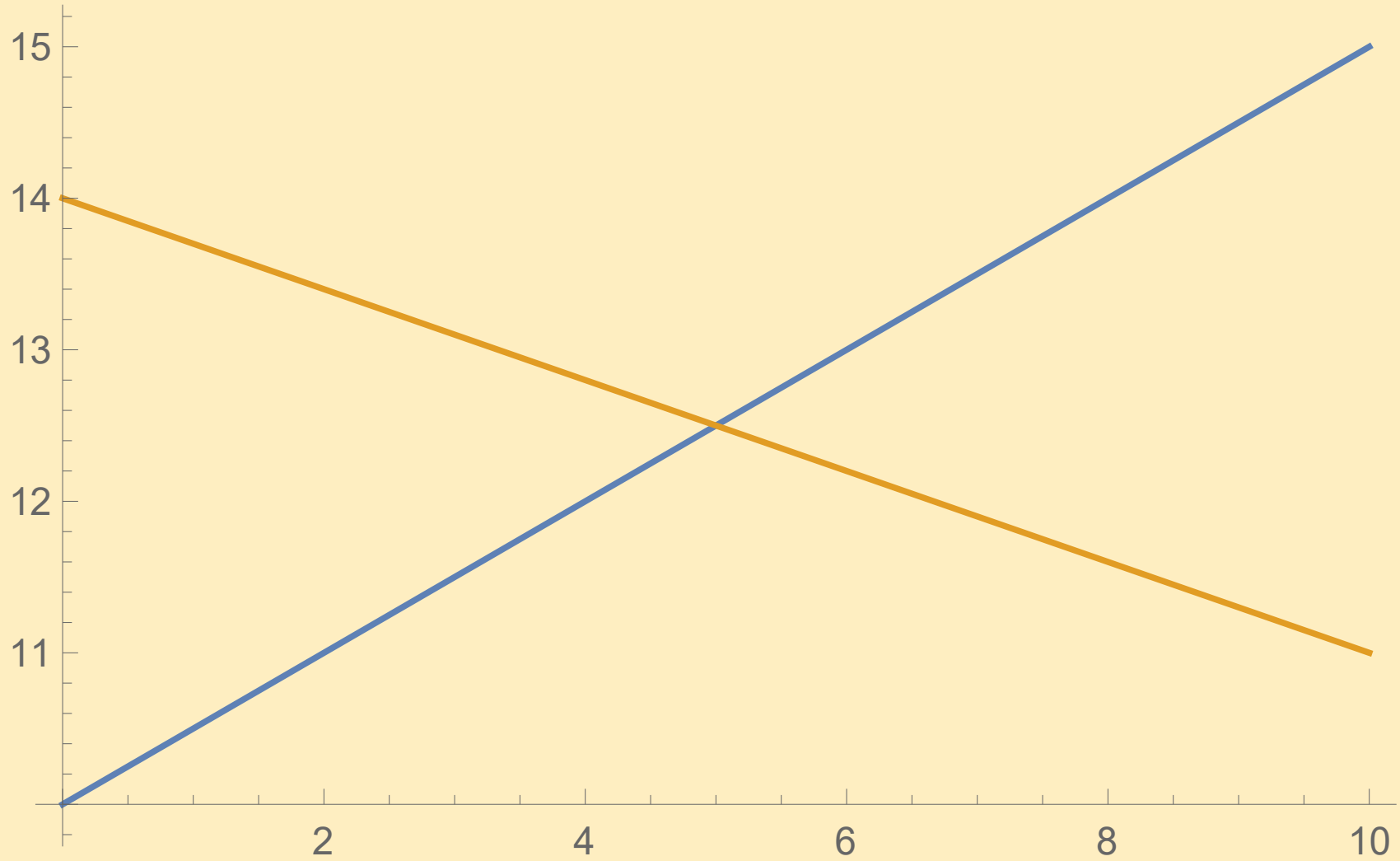
and let the demand function be

$$D(x) = -0.3x + 14.$$

Find the equilibrium point where supply equals demand.

Example

Intersection of Graphs



Intersection of Graphs

Intersection of Graphs

Find the intersection point(s) of

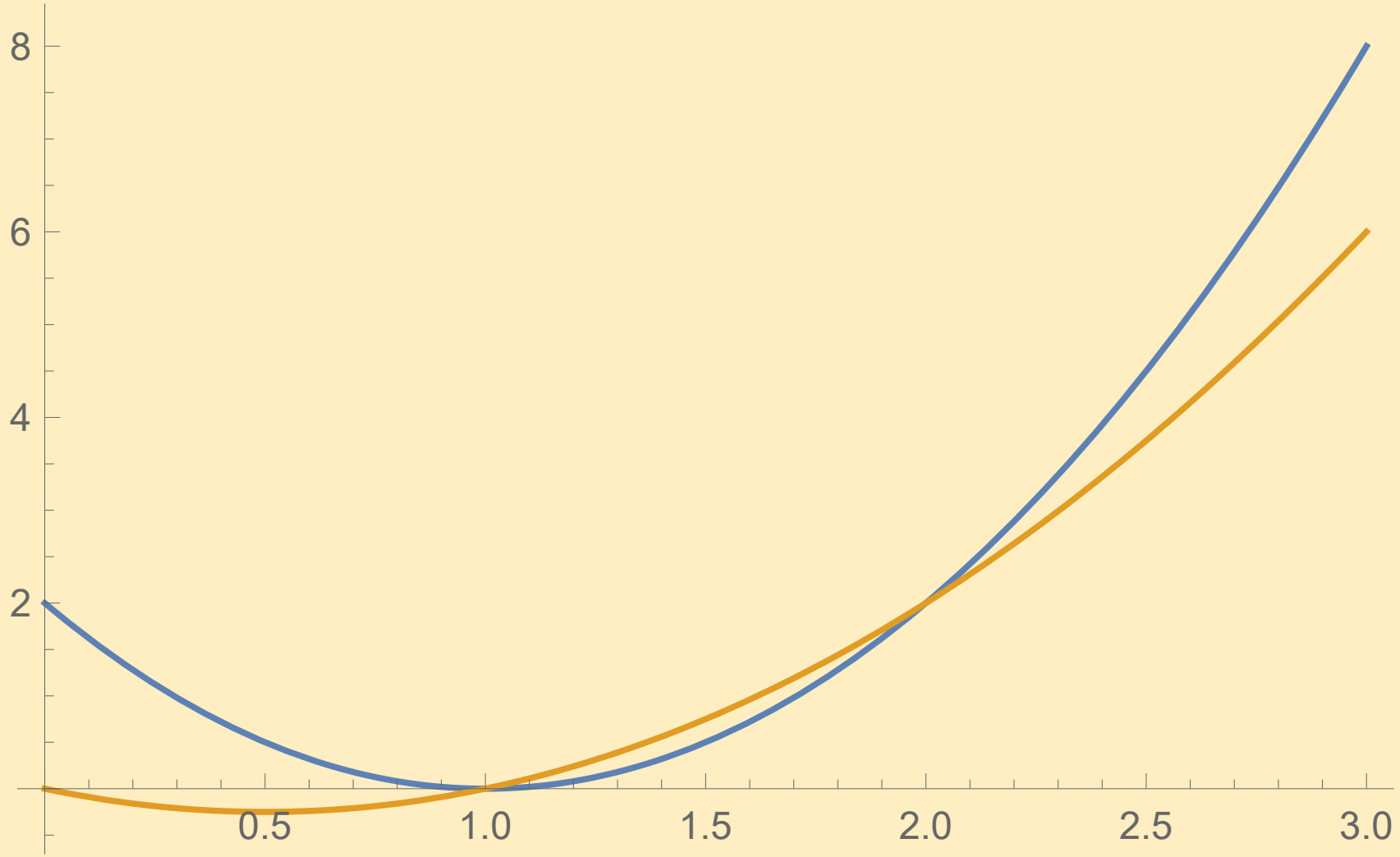
$$f(x) = 2x^2 - 4x + 2$$

and

$$g(x) = x^2 - x.$$

Example

Intersection of Graphs



Vertex of a Parabola

Definition (Vertex of a Parabola)

If a parabola has a vertical axis of symmetry, then the **vertex** of the parabola is

- The *highest point* if the parabola opens downward
- The *lowest point* if the parabola opens upward

Vertex of a Parabola

Vertex of a Parabola

The graph of

$$f(x) = ax^2 + bx + c$$

is a parabola. Its vertex occurs where

$$x = -\frac{b}{2a}.$$

Example

Example 1.2.6

Let the revenue function be

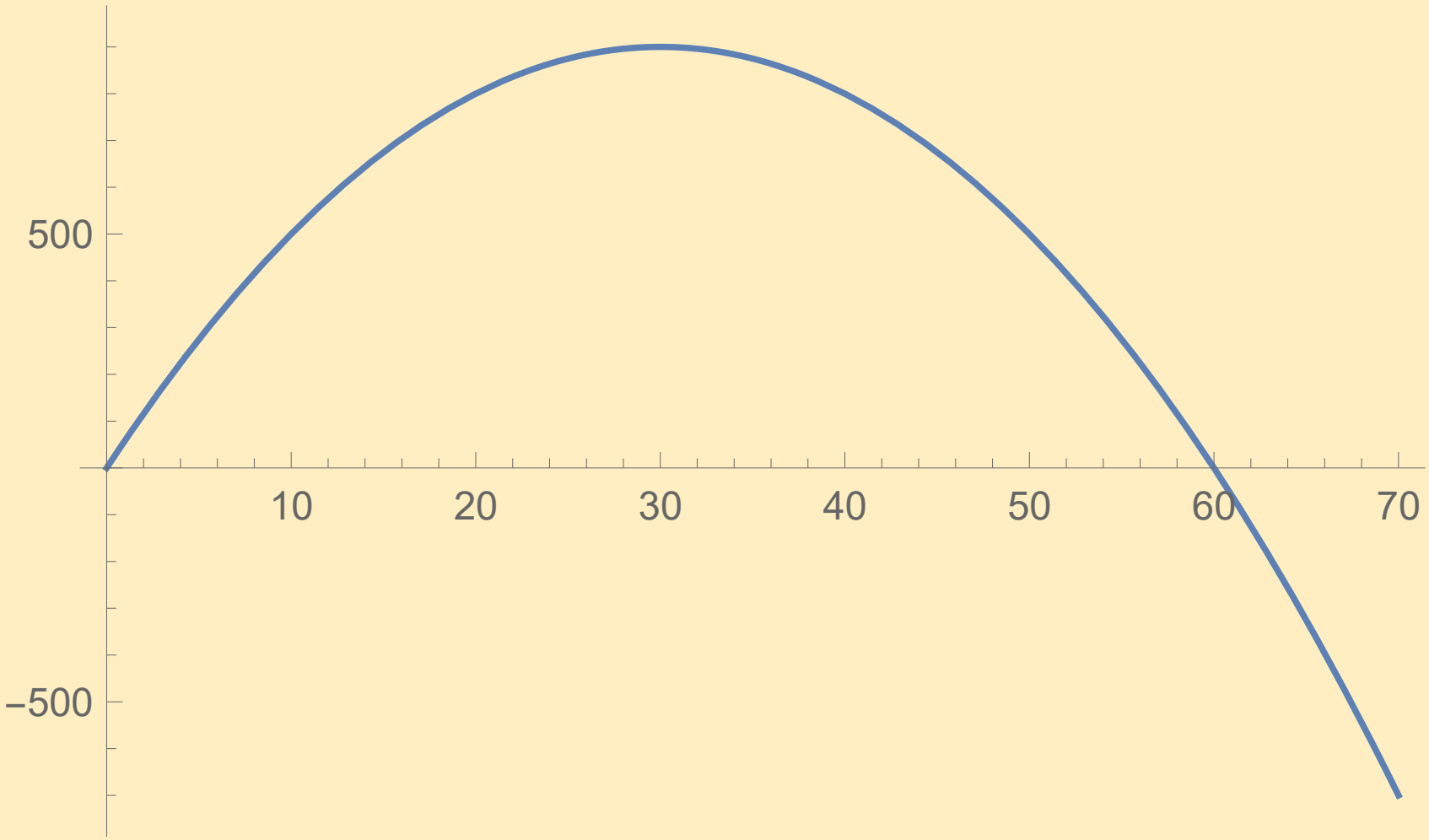
$$R(x) = -x^2 + 60x.$$

(a) Find the value of x that maximizes revenue.

(b) Find the maximum revenue.

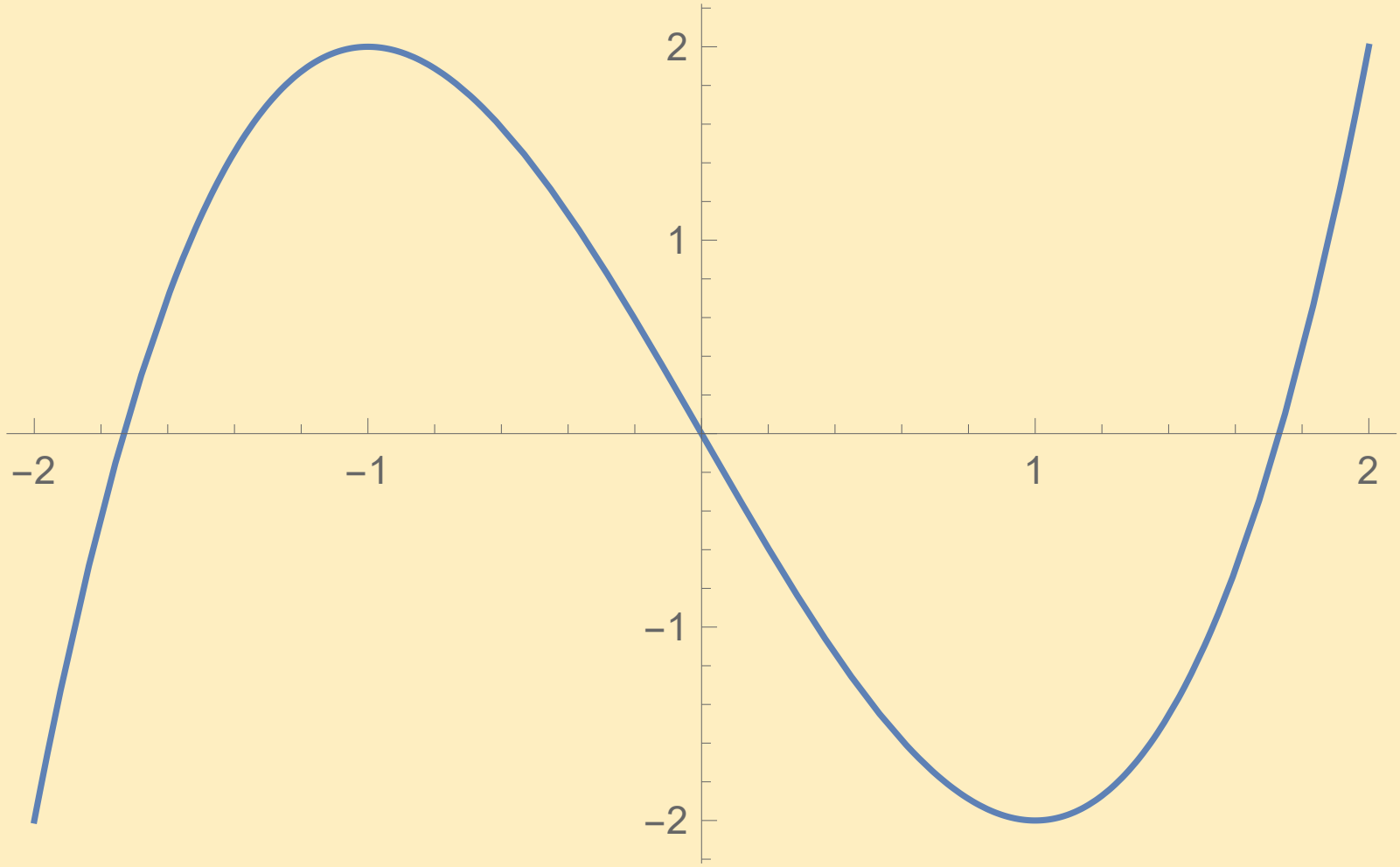
Example

Example 1.2.6



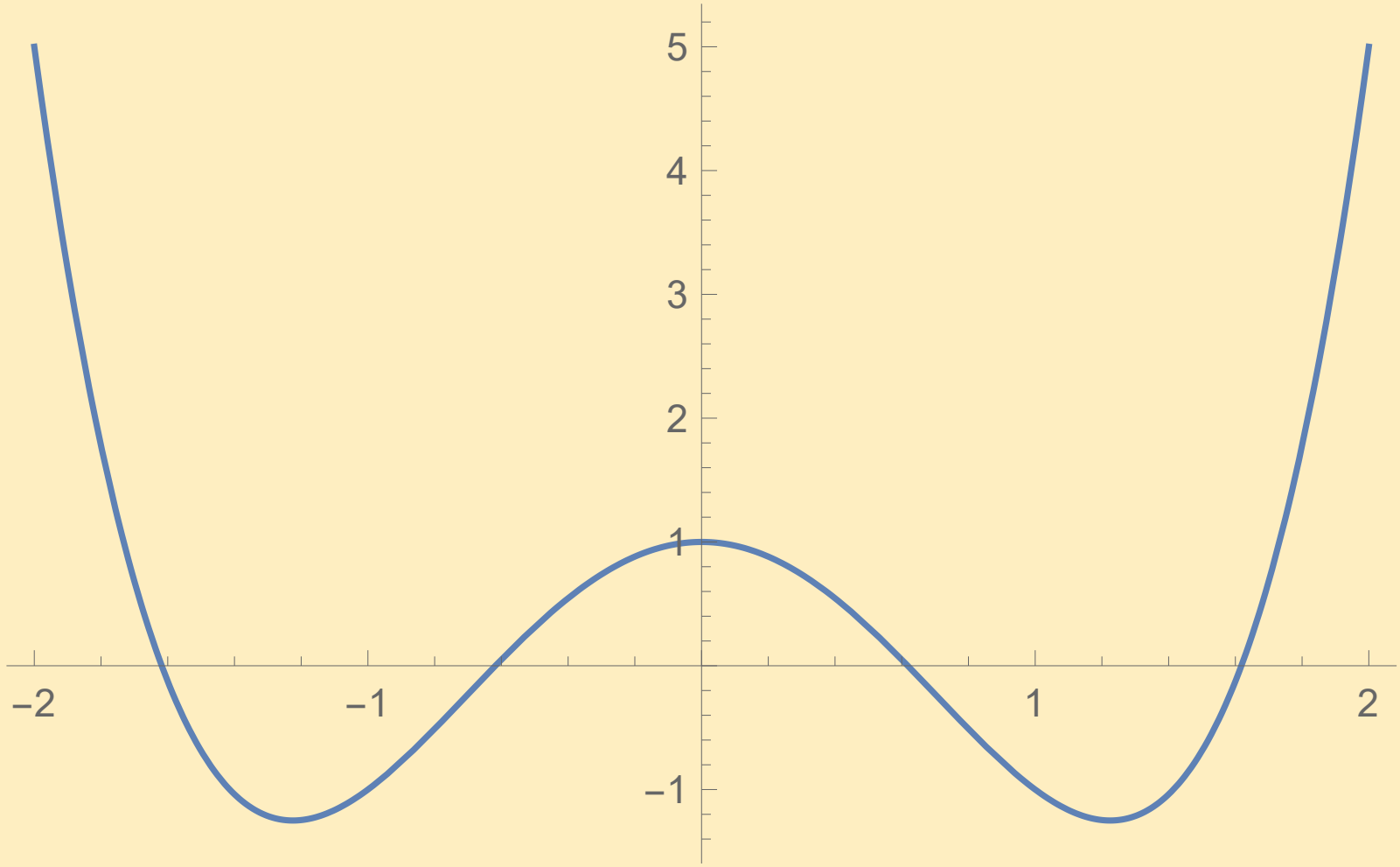
Example

Polynomial of Degree 3: $f(x) = x^3 - 3x$



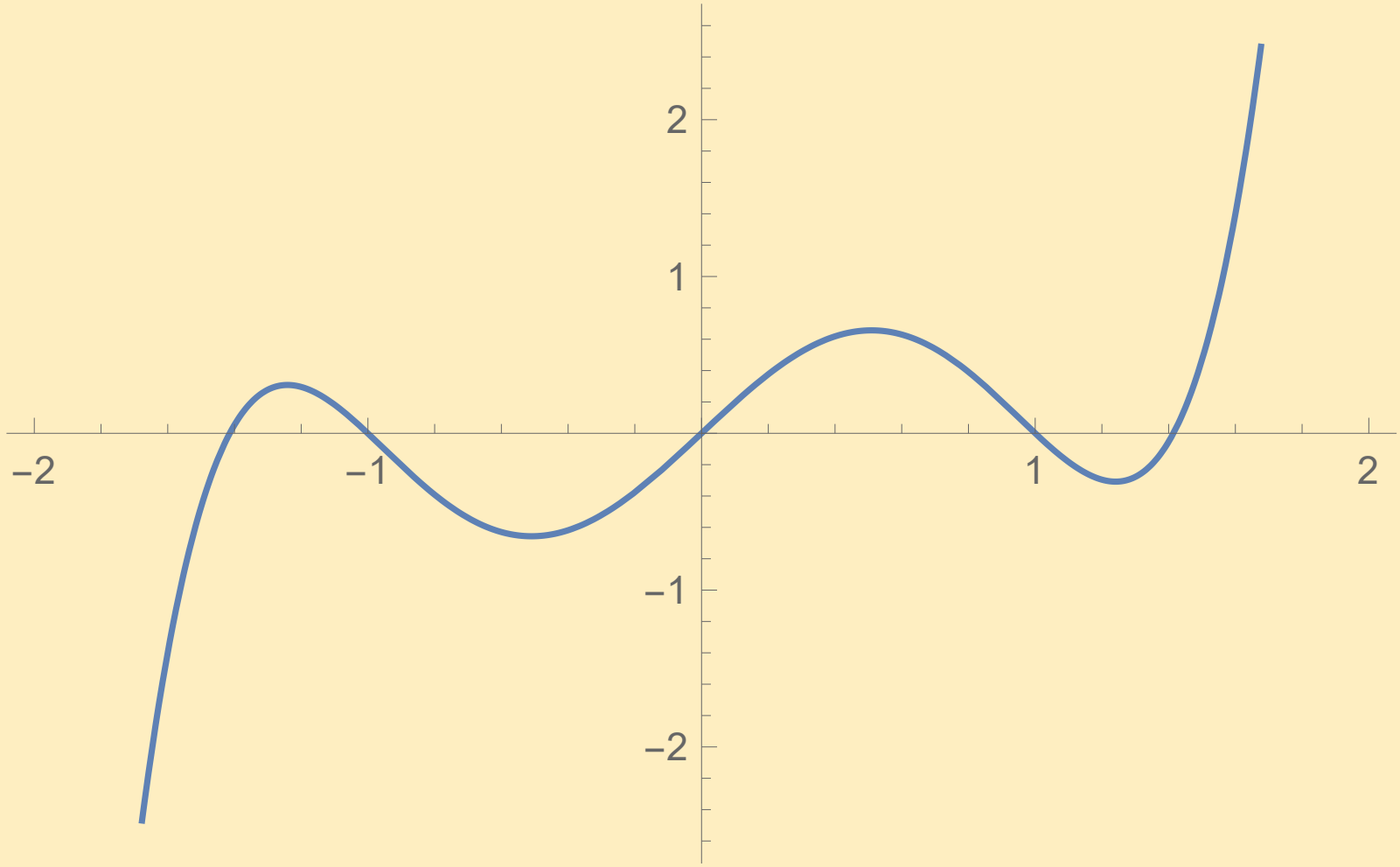
Example

Polynomial of Degree 4: $f(x) = x^4 - 3x^2 + 1$



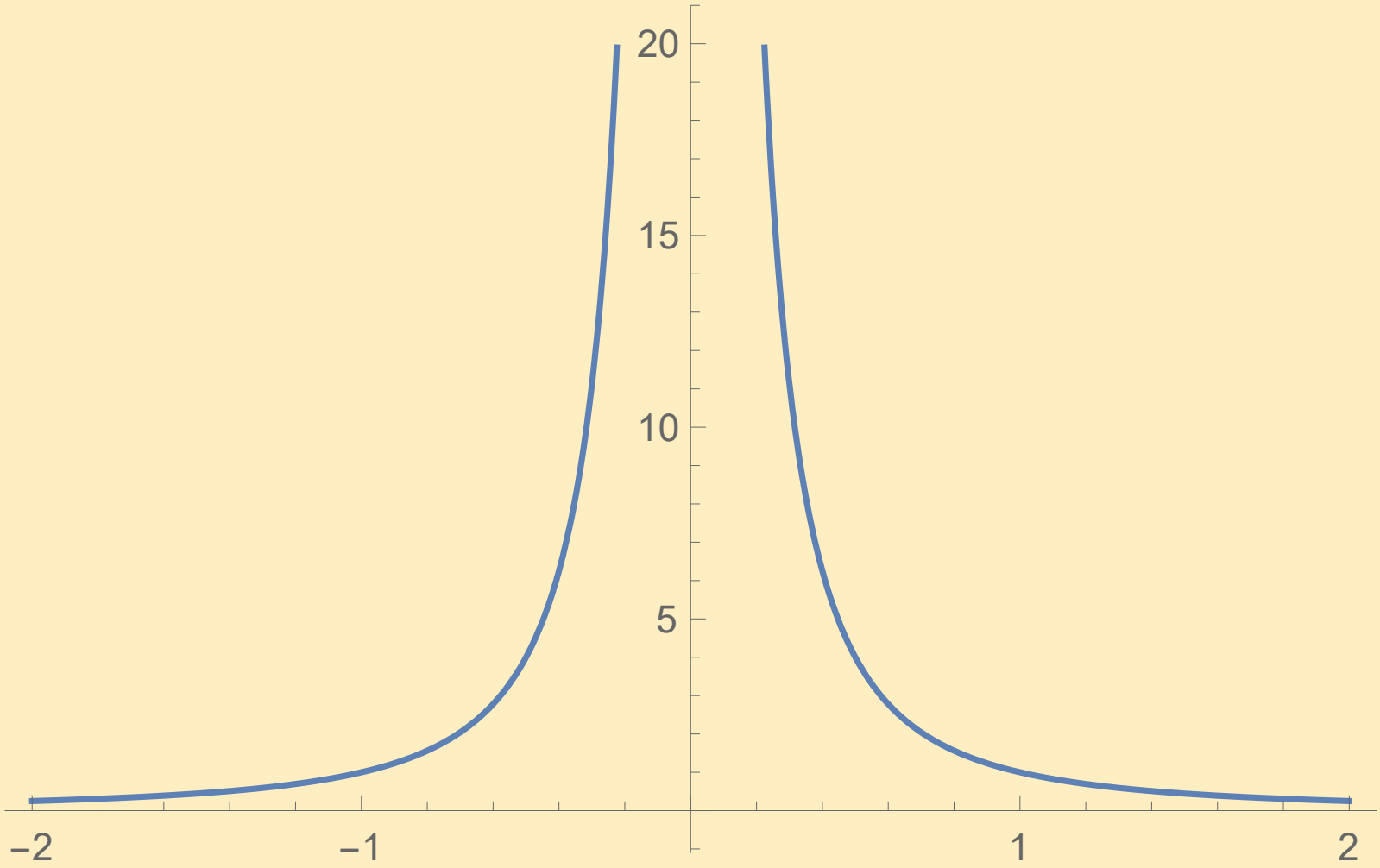
Example

Polynomial of Degree 5: $f(x) = x^5 - 3x^3 + 2x$



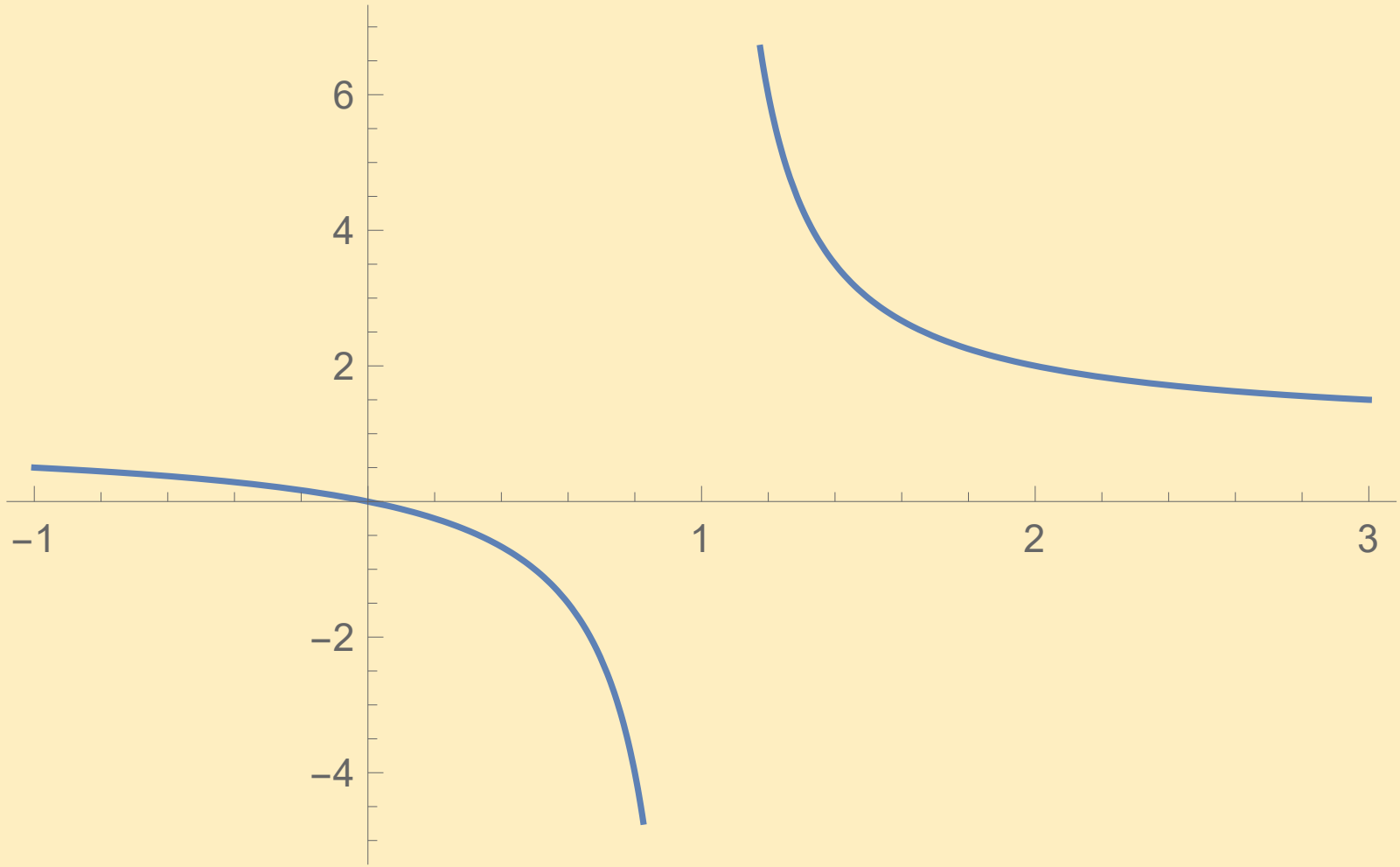
Example

Rational Function: $f(x) = \dfrac{1}{x^2}$



Example

Rational Function: $f(x) = \dfrac{x}{x-1}$



Example

Rational Function: $f(x) = \dfrac{x}{x^2 + 1}$