Limits

Lecture 8
Section 1.5

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Objectives

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- Examine the limit concept.
- Learn the properties of limits.
- Learn various techniques to compute limits.

Definition of the Limit

Definition (Limit of $f(x)$)

Let $f(x)$ be a function and c a real number and L a real number. If

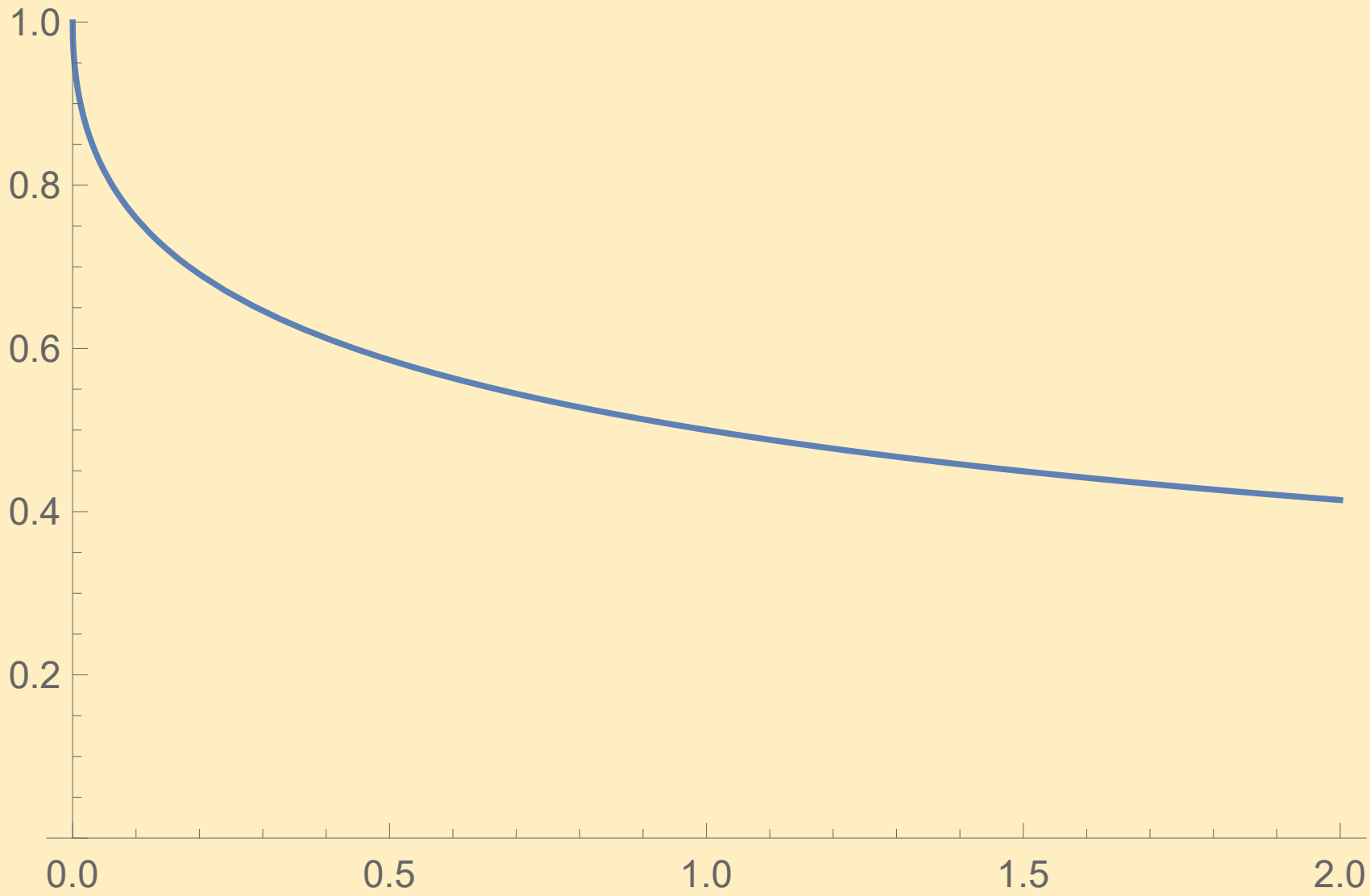
$$f(x) \text{ get “closer and closer” to } L$$

as

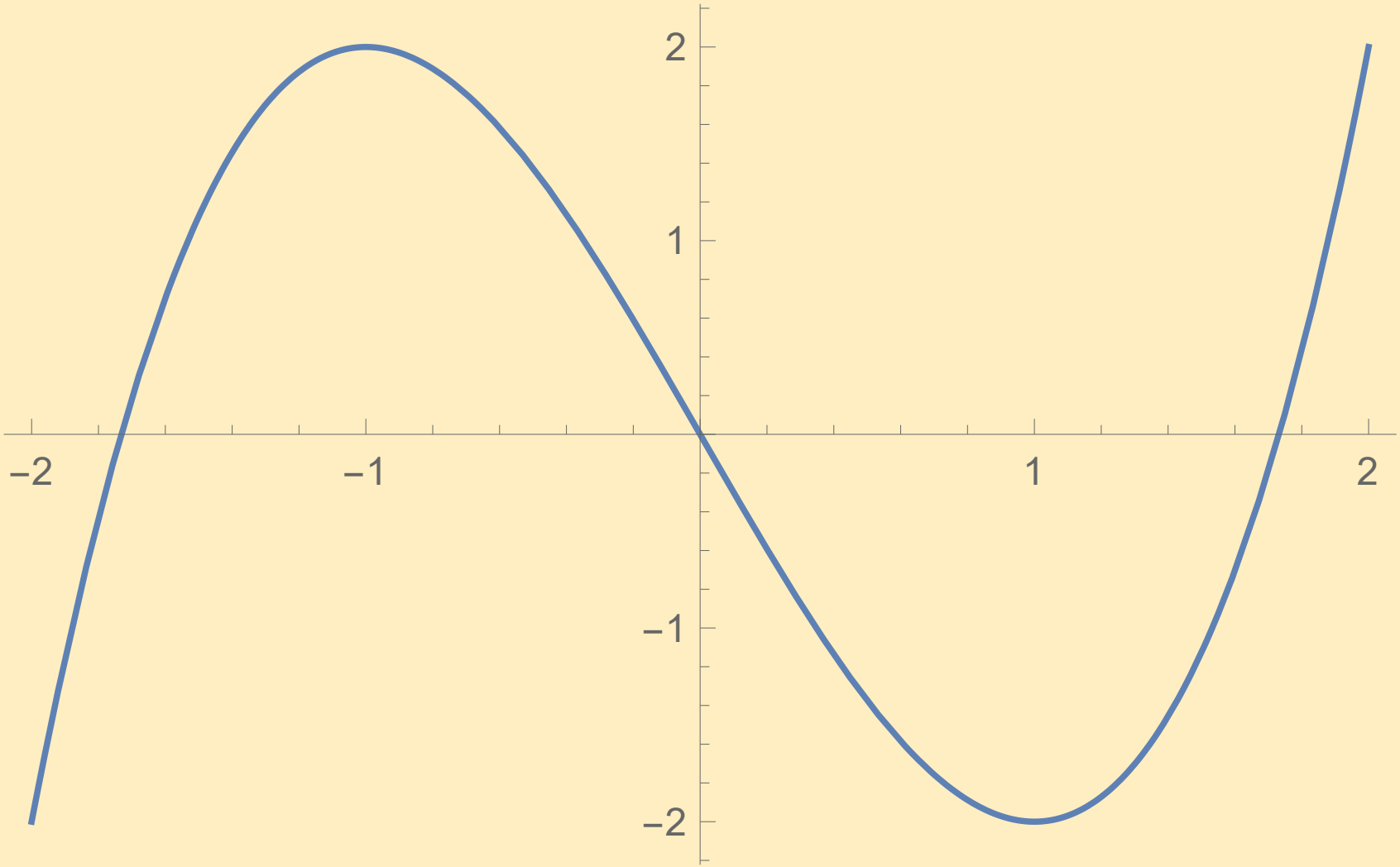
$$x \text{ gets “closer and closer” to } c,$$

then L is the **limit** of $f(x)$ as x approaches c.

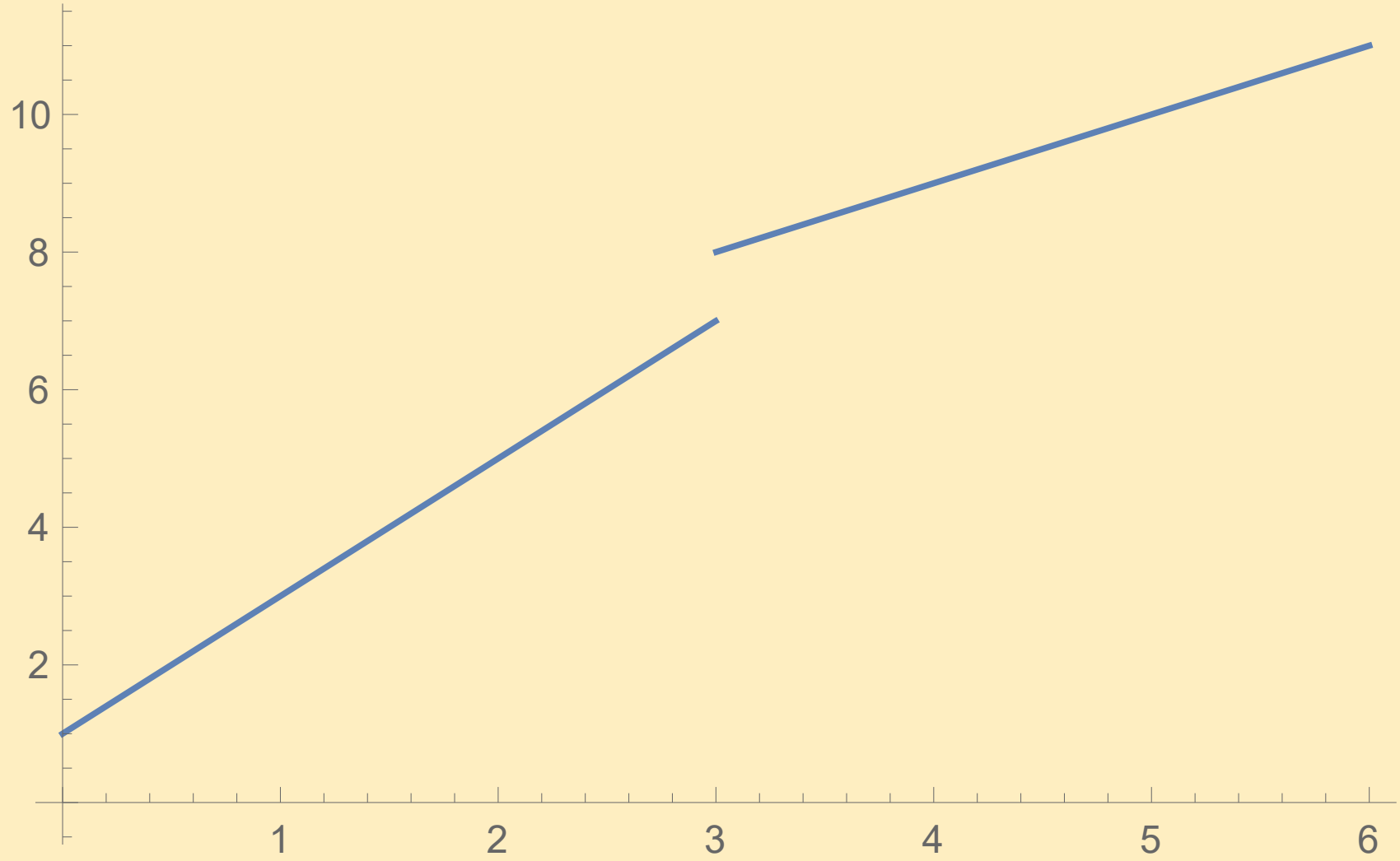
Example: $\lim_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1} = \dfrac{1}{2}$



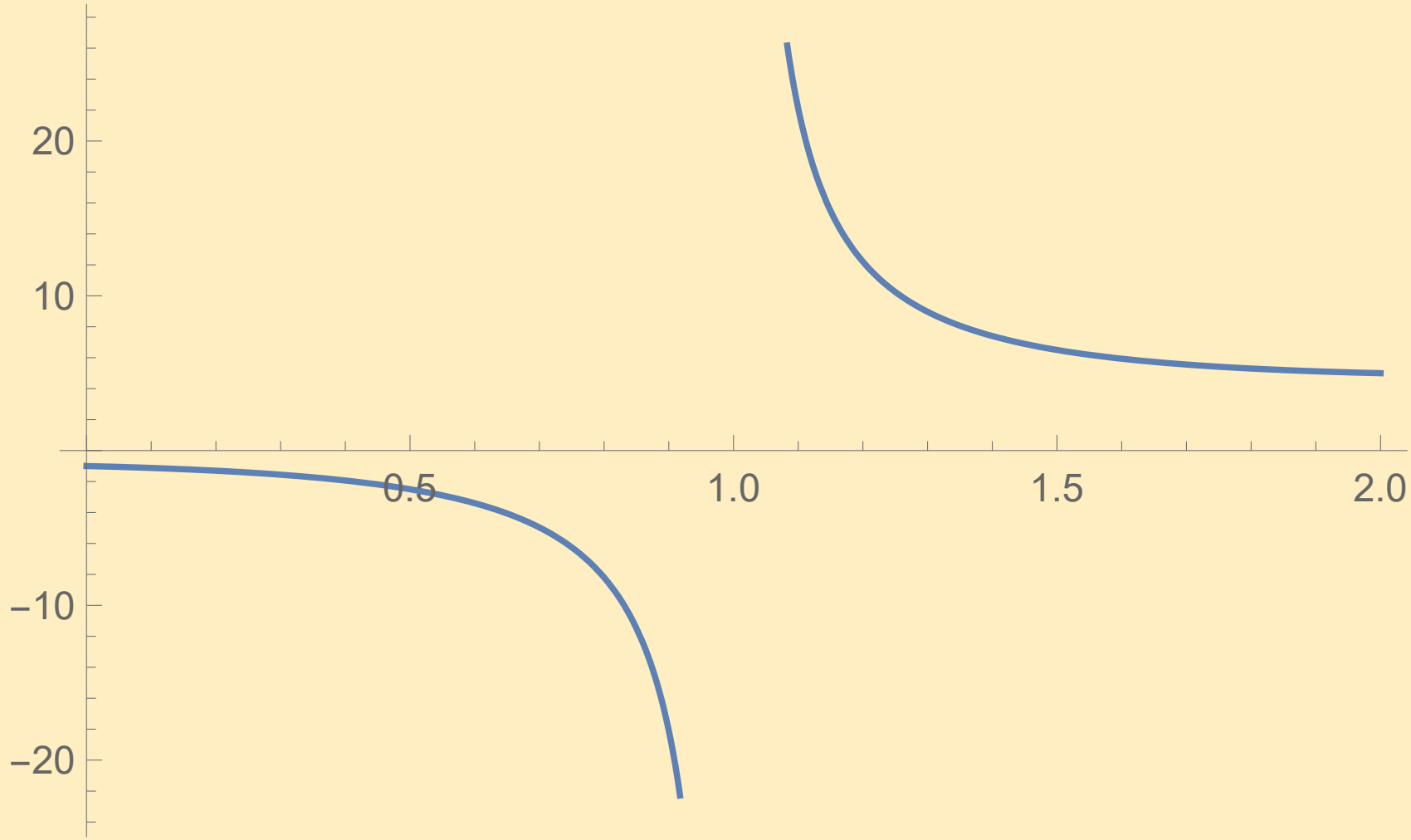
Example: $\lim_{x \to 1} (x^3 - 3x) = -2$



Example: $\lim_{x \to 3} \begin{cases} 2x + 1 & \text{if } x < 3 \\ x + 5 & \text{if } x \geq 3 \end{cases}$ does not exist



Example: $\lim_{x \to 1} \dfrac{x^2 + 1}{x - 1}$ does not exist



Example: $\lim_{x \to 1} \dfrac{x^2 - 1}{x - 1} = 2$