

# Summary of Curve Sketching

Section 4.5

# Summary of Curve Sketching

- ▶ Guidelines for Sketching a Curve:
- ▶ **1. Domain:** It's often useful to start by determining the domain of  $f$ .
- ▶ **2. Intercepts:** The  $y$ -intercept is  $f(0)$ . To find the  $x$ -intercepts, we set  $y = f(x) = 0$  and solve for  $x$ .
- ▶ **3. Symmetry:** Is  $f(x)$  even, odd, or periodic?

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- ▶ **4. Asymptotes:** Find all Horizontal, Vertical, or Slant Asymptotes.

▶ Definition: If  $\lim_{x \rightarrow \infty} [f(x) - (mx + b)] = 0$   
or  $\lim_{x \rightarrow -\infty} [f(x) - (mx + b)] = 0$ , where  $m \neq 0$   
then the line  $y = mx + b$  is called a **slant asymptote** of the curve  $y = f(x)$ .

- ▶ How do we find a slant asymptote?

$$\textcircled{1} \quad m = \lim_{x \rightarrow \pm\infty} \frac{f(x)}{x} \quad \textcircled{2} \quad b = \lim_{x \rightarrow \pm\infty} (f(x) - mx)$$

Ex: Find asymptotes of  $y = f(x) = \frac{x^3}{x^2 - 2x}$  .

Ex: Find slant asymptotes of  $y = f(x) = \sqrt{x^2 + 6x}$

Ex: Find all asymptotes of  $y = f(x) = \frac{2x}{1 - e^x}$ .

Ex: Find all asymptotes of  $y = f(x) = 2\ln x - \ln(3x^2 + 1) + x$ .

# Summary of Curve Sketching

- ▶ **5. Intervals of Increase or Decrease:**  
Compute  $f'(x)$  and use the I/D Test.
- ▶ **6. Local Maximum and Minimum Values**
- ▶ **7. Concavity and Points of Inflection:**  
Compute  $f''(x)$  and use the Concavity Test.
- ▶ **8. Sketch the Curve**



# Review

- ▶ Review steps for curve sketching.
- ▶ How do we find slant asymptotes?