

# LESSON 4: ASYMPTOTES OF A FUNCTION AND CURVE SKETCHING

- Objectives:
1. To find horizontal and vertical asymptotes of a function
  2. To use horizontal and vertical asymptotes in sketching functions

## Vertical Asymptotes

The line  $x = b$  is a vertical asymptote of  $y = f(x)$  if

$$\lim_{x \rightarrow b} f(x) = \pm\infty, \lim_{x \rightarrow b^-} f(x) = \pm\infty, \text{ or } \lim_{x \rightarrow b^+} f(x) = \pm\infty$$

## Horizontal Asymptotes

The line  $y = L$  is a horizontal asymptote of  $y = f(x)$  if

$$\text{Either } \lim_{x \rightarrow \infty} f(x) = L \text{ or } \lim_{x \rightarrow -\infty} f(x) = L$$

ASYMPTOTE

## Examples

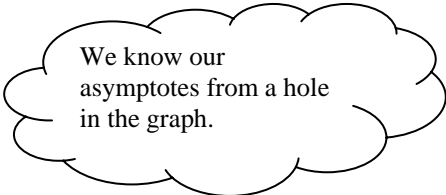
Find the necessary information and sketch.

1.  $f(x) = \frac{1}{x-3}$

3.  $y = \frac{x}{x^2+1}$

2.  $f(x) = \frac{x}{x^2-2x-3}$

4.  $y = \frac{x^3}{2x^2-8}$



We know our asymptotes from a hole in the graph.

## **Problems**

1.  $f(x) = \frac{3x^2}{x^2 - 16}$

4.  $g(x) = \frac{x^2 + 2x - 4}{x^2}$

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

5.  $h(x) = \frac{3x+5}{x^2+1}$

3.  $y = |x^2 - 6x + 5|$