

## Section 4.5: Summary of Curve Sketching (part 2)

### Curvilinear Asymptotes

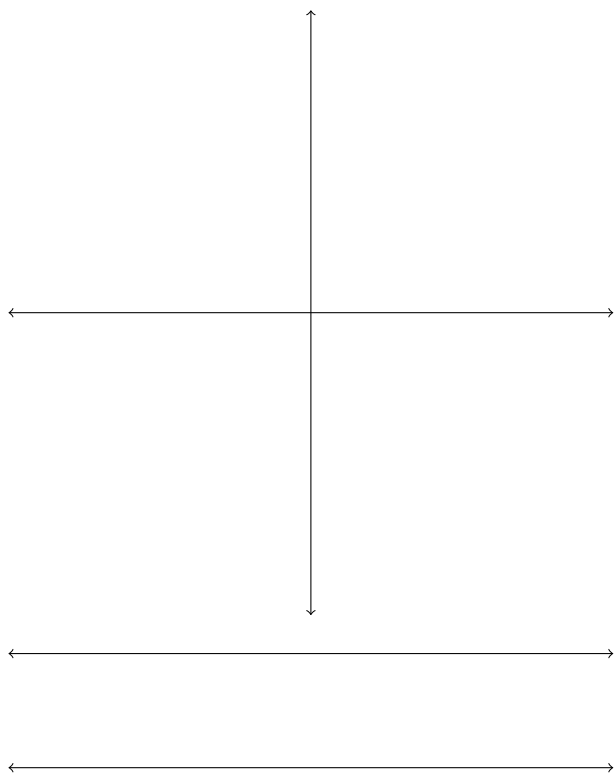
**Question 1.** If  $f(x) = p(x)/q(x)$  is a rational function such that  $p(x)$  and  $q(x)$  have no factors in common (i.e., the “fraction” is reduced), then when will  $f(x)$  have a horizontal asymptote? When will it not?

**Answer 2.**

When the degree of the numerator is \_\_\_\_\_ than the degree of the denominator, other kinds of asymptotes are possible: *curvilinear* (sometimes called *slant* or *oblique* if degree is 1). To see what these new kinds of asymptotes are, we use polynomial long division.

**Theorem 3.** *A rational function cannot have both a horizontal asymptote and a curvilinear (including slant) asymptote. Why?*

**Example 4.** Identify the curvilinear asymptote of  $g(x) = \frac{x^3}{x^2 + 1}$  and sketch its graph.



**Example 5.** Sketch the graph of  $f(x) = \frac{x^2 + x + 1}{x - 1}$ .

