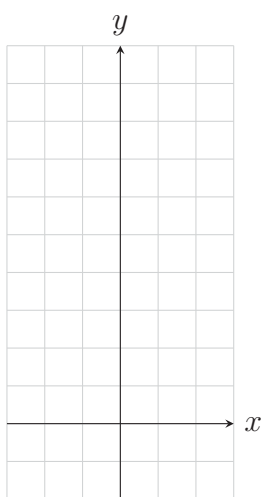


**Definition:** A **rational function** is a function of the form

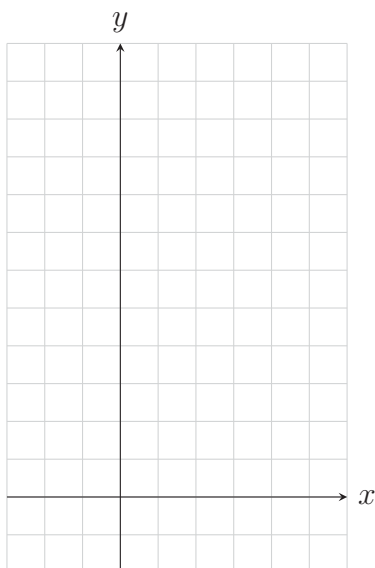
$$R(x) = \frac{p(x)}{q(x)}$$

where  $p$  and  $q$  are polynomial functions.

1. Graph and analyze the function  $H(x) = \frac{1}{x^2}$



2. Use transformations to graph  $R(x) = \frac{1}{(x-2)^2} + 1$ .



3. Find the vertical asymptotes, if any, of the graph of each rational function given.

a.  $F(x) = \frac{x+3}{x-1}$

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

b.  $R(x) = \frac{x}{x^2-4}$

d.  $G(x) = \frac{x^2-9}{x^2+4x-21}$

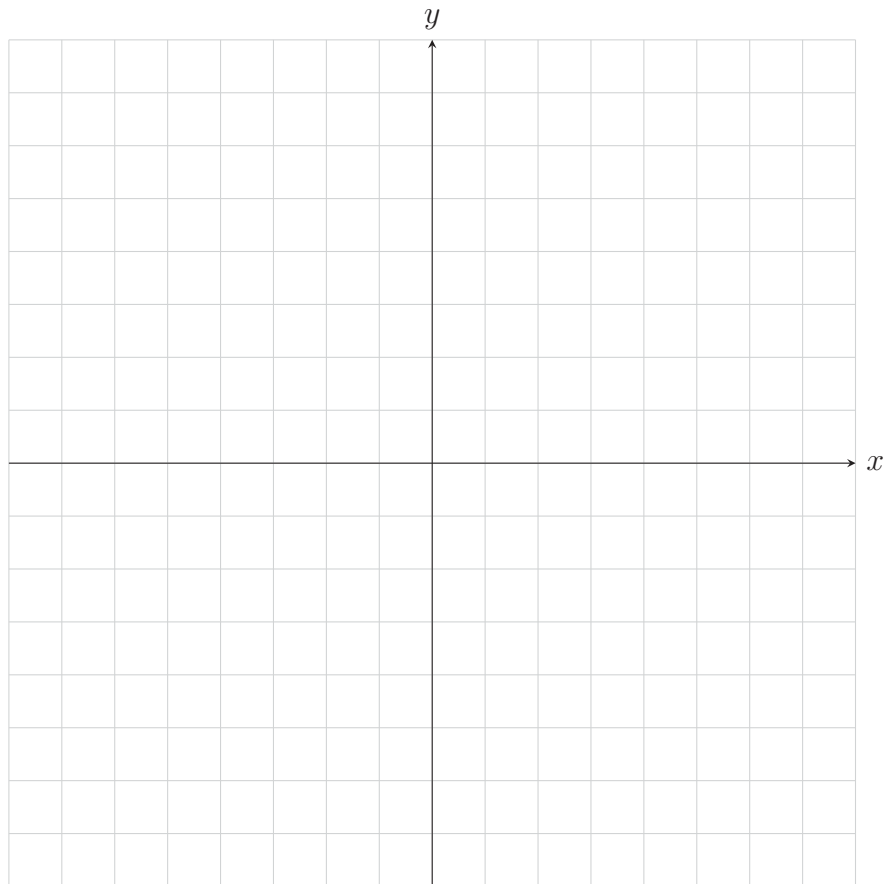
4. Determine if the following functions have a horizontal asymptote, an oblique asymptote, or neither. If it does have one or the other, find it.

a.  $R(x) = \frac{x-12}{4x^2+x+1}$

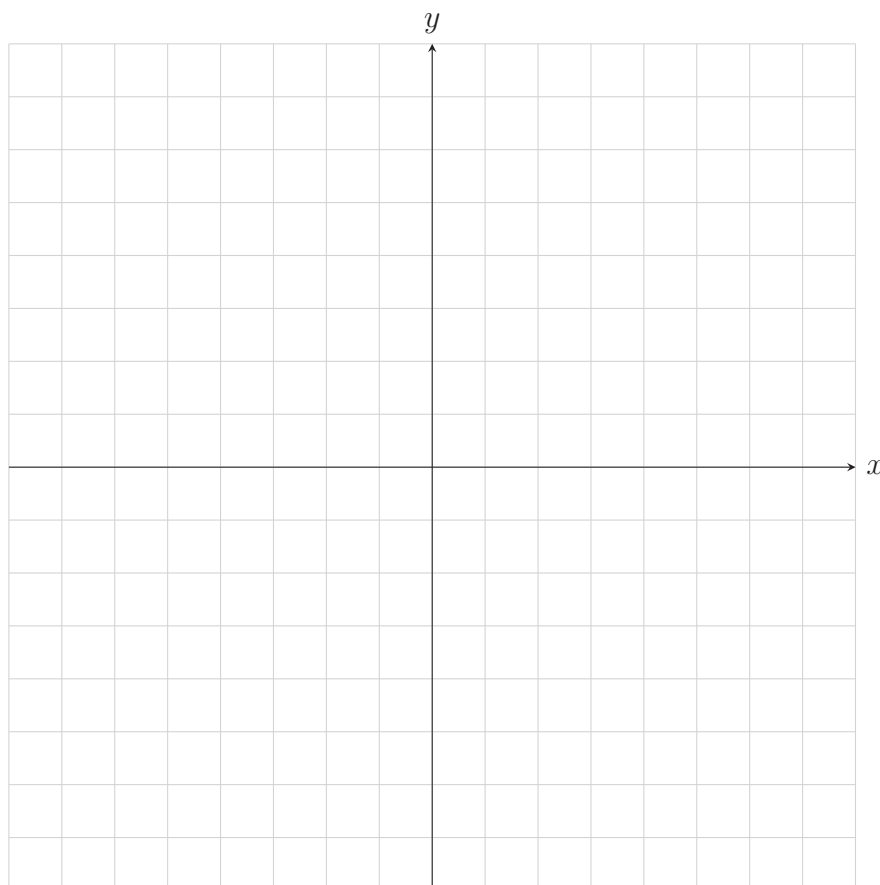
b.  $H(x) = \frac{3x^4-x^2}{x^3-x^2+1}$

c.  $K(x) = \frac{8x^2 - x + 2}{4x^2 - 1}$

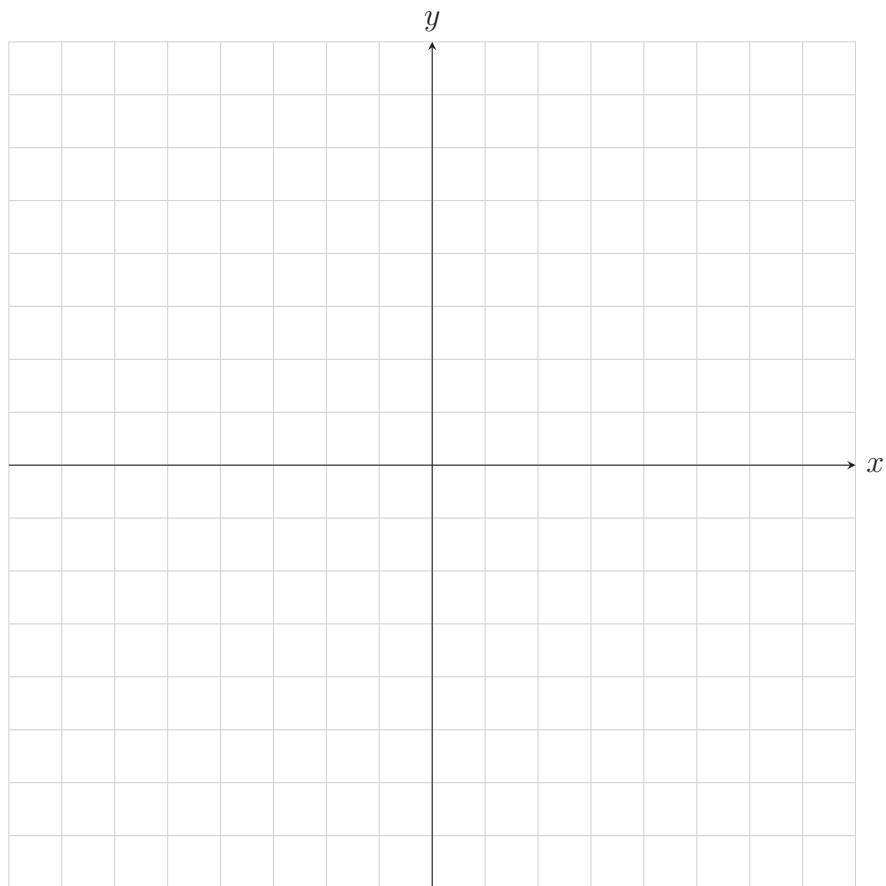
5. For the function  $R(x) = \frac{2x^2 - 5x + 2}{x^2 - 4}$  determine the domain, any vertical asymptotes and any horizontal or oblique asymptotes. Sketch a graph of the function.



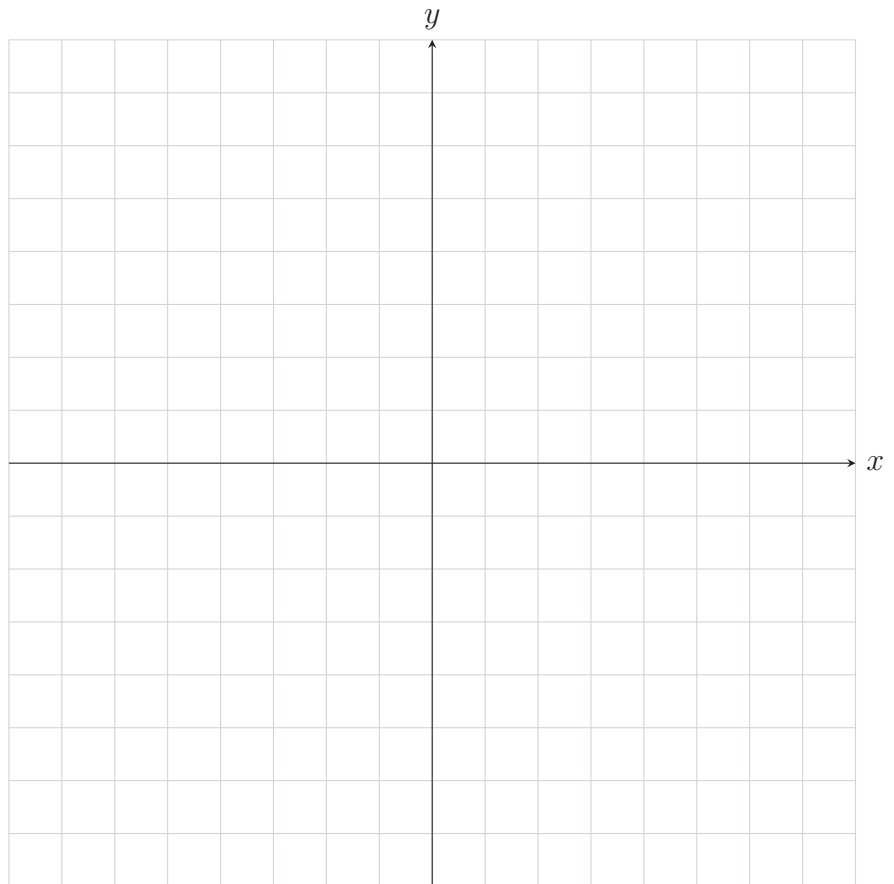
6. Analyze and then graph the rational function  $f(x) = \frac{x + 2}{x^2 - 5x - 6}$ .



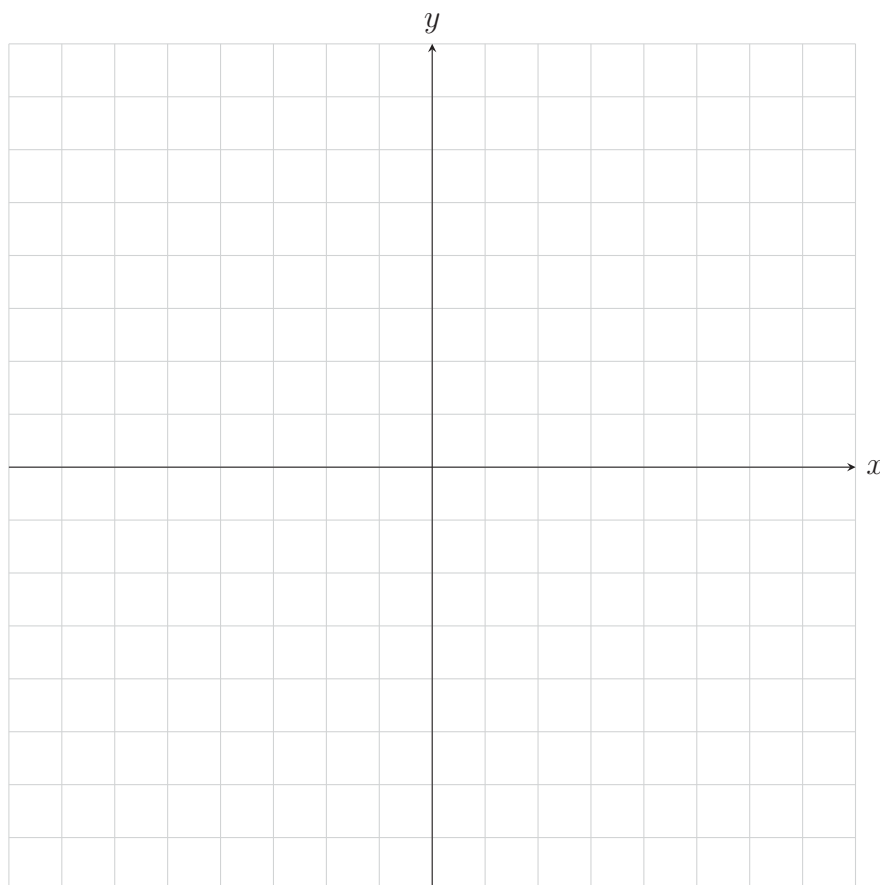
7. Analyze and then graph the rational function  $R(x) = \frac{x^2 - 1}{x}$ .



8. Analyze and then graph the rational function  $R(x) = \frac{x^4 + 1}{x^2}$ .



9. Analyze and then graph the rational function  $R(x) = \frac{3x^2 - 3x}{x^2 + x - 12}$ .



10. Find a rational function that might have the following graph.

