

### *Reciprocals of Parabolas*

NO CALCULATORS ON THIS SHEET!!! (Yes, it's time to think!)

Let  $f(x) = x^2 - 4$  and let  $g$  be the reciprocal function, so  $g(x) =$ \_\_\_\_\_.

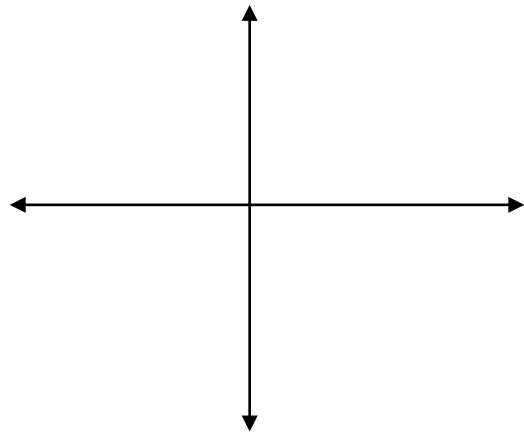
We want to look at the graph of  $y = f(x)$  and use its characteristics along with our knowledge of arithmetic to determine the graph of  $y = g(x)$ .

1. On the axes to the right, carefully sketch the graph of  $y = f(x)$ . Label all intercepts.

2. If  $f$  is positive, what may be said about  $g$ ?

If  $f$  is negative, what may be said about  $g$ ?

3. State the domain of  $g$ .



How is the domain of  $g$  related to the original function  $f$ ?

4. If  $x > 2$  but  $x$  gets closer and closer to 2, what happens to the value of  $g(x)$ ?

If  $x < -2$  but  $x$  gets closer and closer to  $-2$ , what happens to  $g(x)$ ?

If  $0 < x < 2$  but  $x$  approaches 2, what happens to  $g(x)$ ?

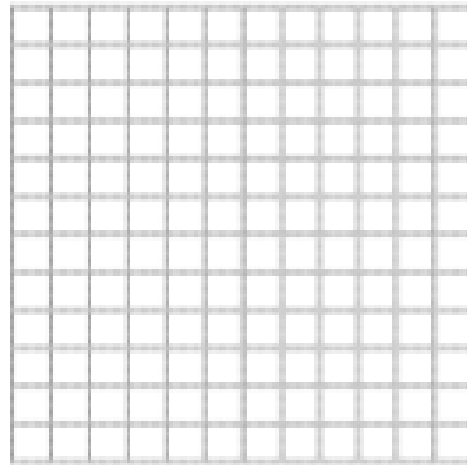
If  $-2 < x < 0$  but  $x$  approaches  $-2$ , what happens to  $g(x)$ ?

This means that the lines  $x = 2$  and  $x = -2$  are called \_\_\_\_\_

5. As  $x$  approaches  $+\infty$ , then  $f(x)$  approaches \_\_\_\_\_ and  $g(x)$  approaches \_\_\_\_\_, so the line with equation \_\_\_\_\_ is a horizontal asymptote of  $g$ .
6. At what  $y$ -value(s) will the graphs of  $f$  and  $g$  intersect?
7. What are the coordinates of the minimum value of  $f$ ?

What is the corresponding point on  $g$ ?

8. Using your answers above, sketch the graph of  $g$ .



9. On top of the graph below, sketch the graph of the reciprocal of the given function. Take note of the zeros, asymptotes, and points where the graphs cross.

