

# Rational Functions

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

A *rational function*  $r$  is a function of the form  $r(x) = \frac{f(x)}{g(x)}$  where  $f$  and  $g$  are polynomials with  $g(x) \neq 0$

1. Identify which if the following are rational functions:

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

$$g(x) = \sqrt[4]{x^2 + 4}$$

$$h(x) = \frac{x^2 - 4}{x - 2}$$

2. Identify which of the above are functions and then determine the domain.

The line  $x = a$  is called a *vertical asymptote* of the graph of a function  $f$   
if  $f(x) \rightarrow \infty$  as  $x \rightarrow a^+$  or as  $x \rightarrow a^-$  or  
if  $f(x) \rightarrow -\infty$  as  $x \rightarrow a^+$  or as  $x \rightarrow a^-$ .

The line  $y = k$  is a *horizontal asymptote* of the graph of a function  $f$   
if  $f(x) \rightarrow k$  as  $x \rightarrow \infty$  or  
if  $f(x) \rightarrow k$  as  $x \rightarrow -\infty$ .

If  $f(x) = \frac{N(x)}{D(x)}$  is a rational function where  $N(x)$  and  $D(x)$  do not have a common factor and  $c$  is a real zero of  $D(x)$ , then the line  $x = c$  is a vertical asymptote.

3. Graph

$$\frac{2}{x-1}$$

$$\frac{-3x-4}{x+2}$$

