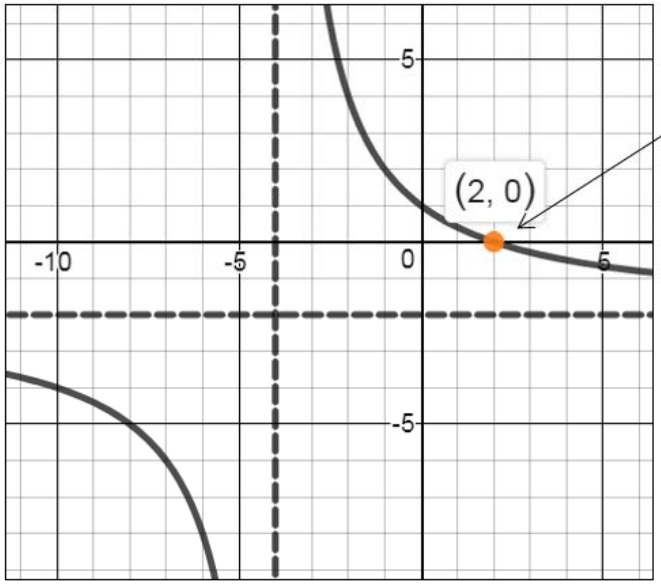
Objective: Determine key features of a rational function from its graph

Concept

Zeros: The **zero of a function** is a **value of x** that makes the value of a function equal to zero.



Objective: Determine key features of a rational function from its graph

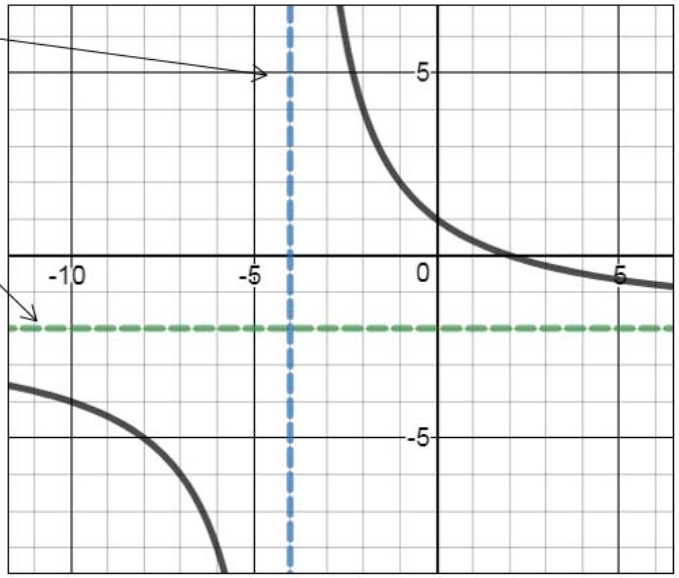
Concept

Asymptote: An **asymptote is a line that the graph of a function approaches but never touches as the value of x approaches positive or negative infinity.**

Rational functions contain both **vertical asymptotes** and **horizontal asymptotes**. **Asymptotes** are visually represented by **dashed** lines.

vertical asymptote
$x = -4$

horizontal asymptote
$y = -2$



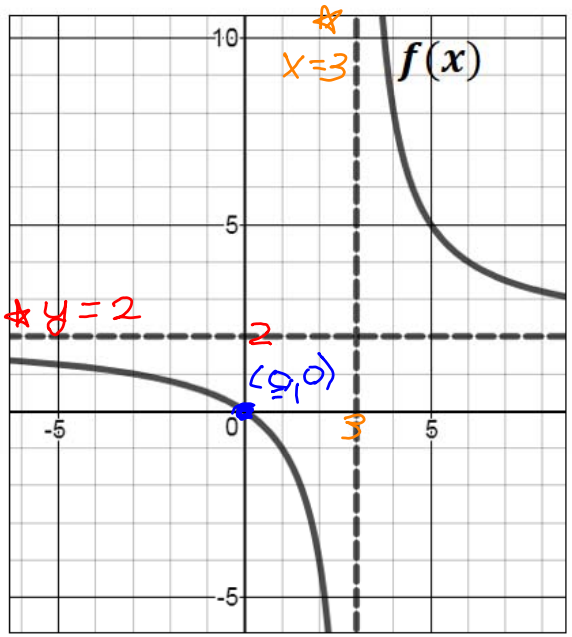
Objective: Determine key features of a rational function from its graph

Ex) Determine the key features for the function $f(x)$.

The zero(s) are at 0.

The vertical asymptote is $x = 3$

The horizontal asymptote is $y = 2$



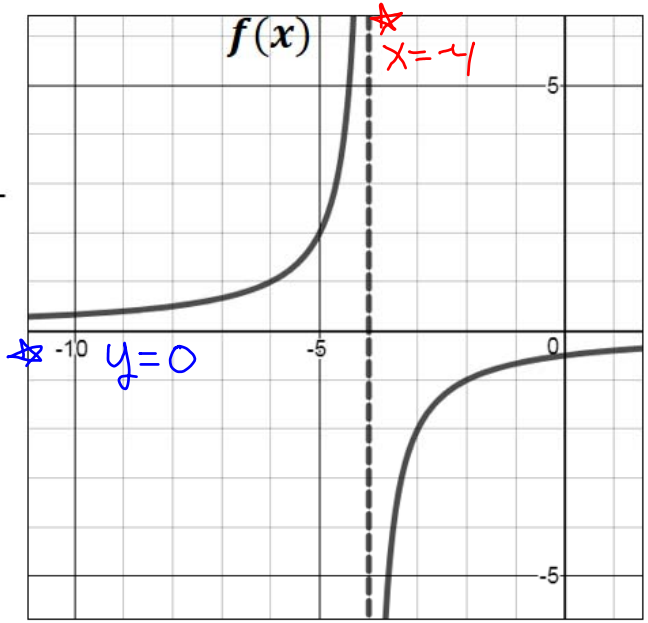
Objective: Determine key features of a rational function from its graph

Ex) Determine the key features for the function $f(x)$.

The zero(s) are at no zeros.

The vertical asymptote is $x = -4$

The horizontal asymptote is $y = 0$

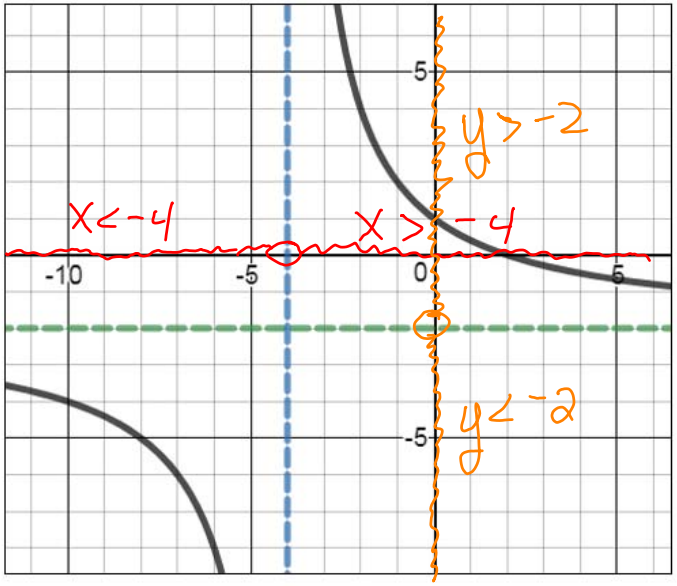


Objective: Determine key features of a rational function from its graph

Concept

The **domain of a function** is the set of all **inputs (values of x)** over which the function is defined.

The **range of a function** is the set of all **outputs (values of y).**



Domain: $x < -4 \; or \; x > -4$

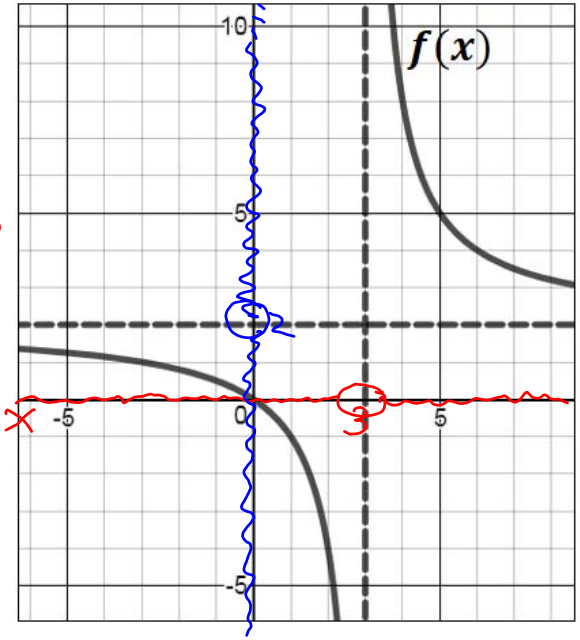
$(-\infty, -4) \cup (-4, \infty)$

Range: $y < -2 \; or \; y > -2$

$(-\infty, -2) \cup (-2, \infty)$

Objective: Determine key features of a rational function from its graph

Ex) Determine the key features for the function $f(x)$.

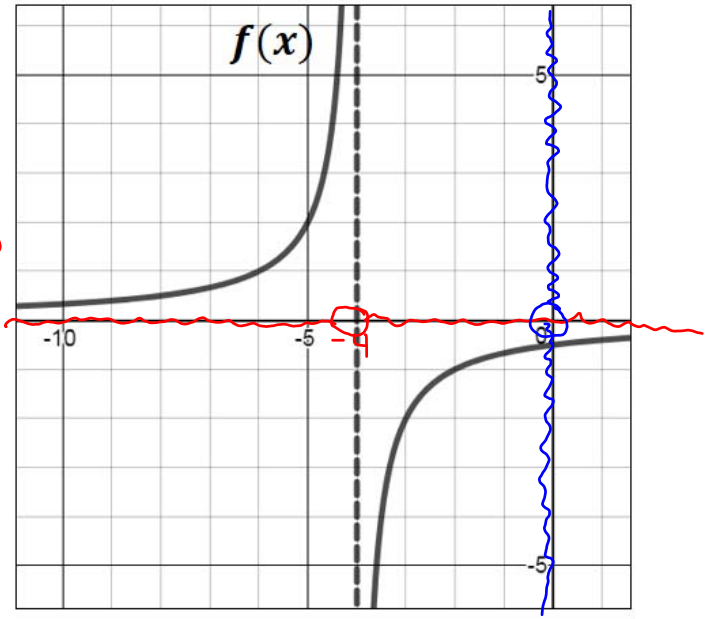


The domain is $x<3$ or $x>3$ / $(-\infty,3)\cup(3,\infty)$
(inequality) (interval)

The range is $y<2$ or $y>2$ / $(-\infty,2)\cup(2,\infty)$
(inequality) (interval)

Objective: Determine key features of a rational function from its graph

Ex) Determine the key features for the function $f(x)$.



The domain is $x<-4$ or $x>-4$ / $(-\infty,-4)\cup(-4,\infty)$
(inequality) (interval)

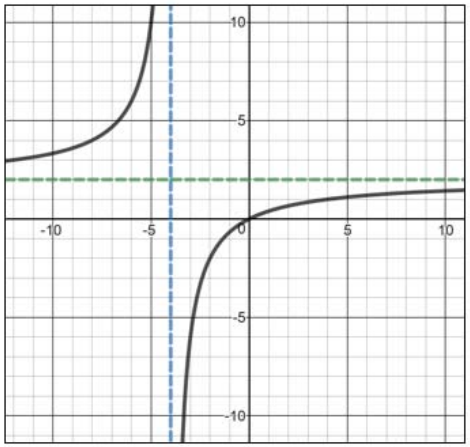
The range is $y<0$ or $y>0$ / $(-\infty,0)\cup(0,\infty)$
(inequality) (interval)

Objective: Determine key features of a rational function from its graph

Concept

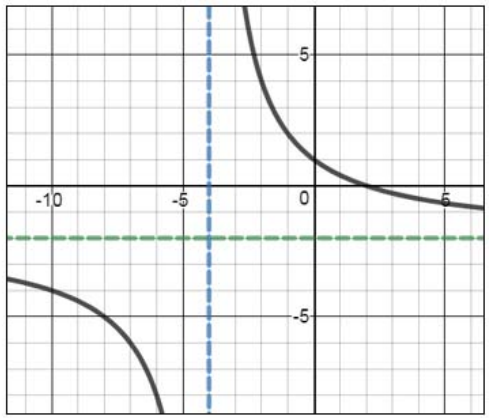
A function is **increasing when the function values increase as the values of the domain increase**. A function can be always increasing or increasing for a specific interval of the domain.

A function is **decreasing when the function values decrease as the values of the domain increase**. A function can be always decreasing or decreasing for a specific interval of the domain.



Increasing for: $x < -4 \; or \; x > -4$

$(-\infty, -4) \cup (-4, \infty)$



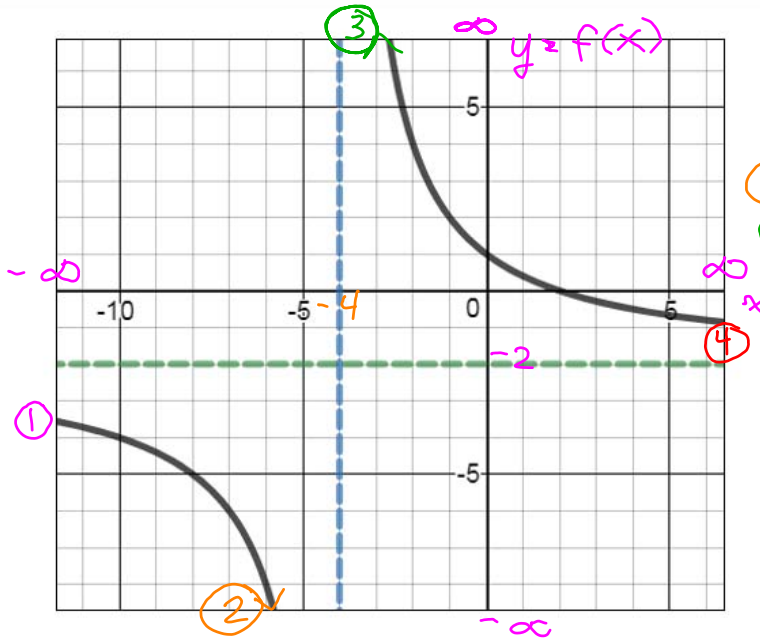
Decreasing for: $x < -4 \; or \; x > -4$

$(-\infty, -4) \cup (-4, \infty)$

Objective: Determine key features of a rational function from its graph

Concept

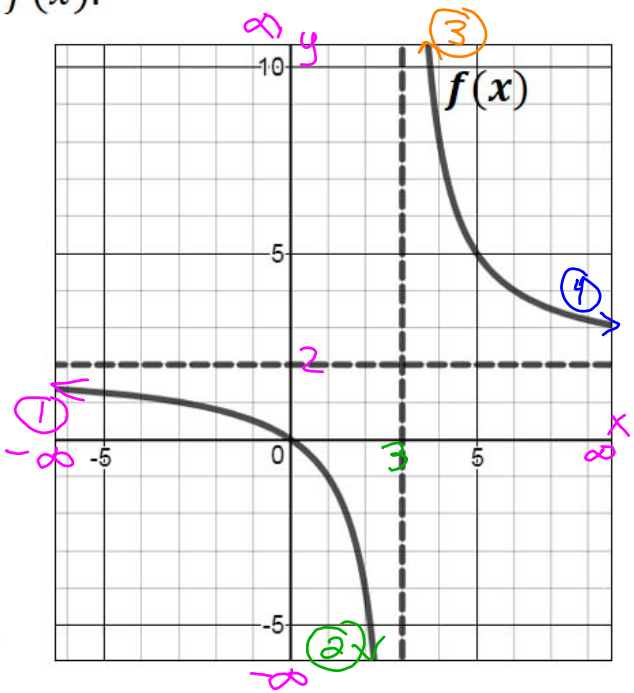
For a rational function, **end behavior** is a mathematical description of the value the function approaches as x approaches negative infinity, positive infinity, and any value of a vertical asymptote.



1. $as\ x \to -\infty, f(x) \to -2^-$
2. $as\ x \to -4^-, f(x) \to -\infty$
3. $as\ x \to -4^+, f(x) \to \infty$
4. $as\ x \to \infty, f(x) \to -2^+$

Objective: Determine key features of a rational function from its graph

Ex) Determine the key features for the function $f(x)$.



$f(x)$ is increasing/decreasing (circle one) for

$x < 3$ or $x > 3$ / $(-\infty, 3) \cup (3, \infty)$

(inequality) (interval)

The end behavior of $f(x)$ is

1) as $x \to -\infty$, $f(x) \to 2^-$

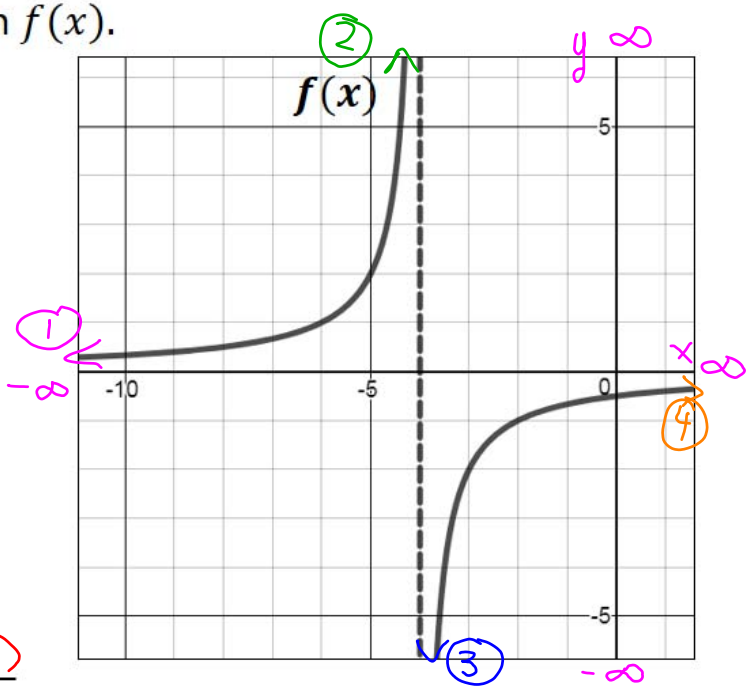
2) as $x \to 3^-$, $f(x) \to -\infty$

3) as $x \to 3^+$, $f(x) \to \infty$

4) as $x \to \infty$, $f(x) \to 2^+$.

Objective: Determine key features of a rational function from its graph

Ex) Determine the key features for the function $f(x)$.



$f(x)$ is increasing/decreasing (circle one) for

$x < -4$ or $x > -4$ / $(-\infty, -4) \cup (-4, \infty)$

(inequality) (interval)

The end behavior of $f(x)$ is

1. as $x \to -\infty$, $f(x) \to 0^+$
2. as $x \to -4^-$, $f(x) \to \infty$
3. as $x \to -4^+$, $f(x) \to -\infty$
4. as $x \to \infty$, $f(x) \to 0^-$