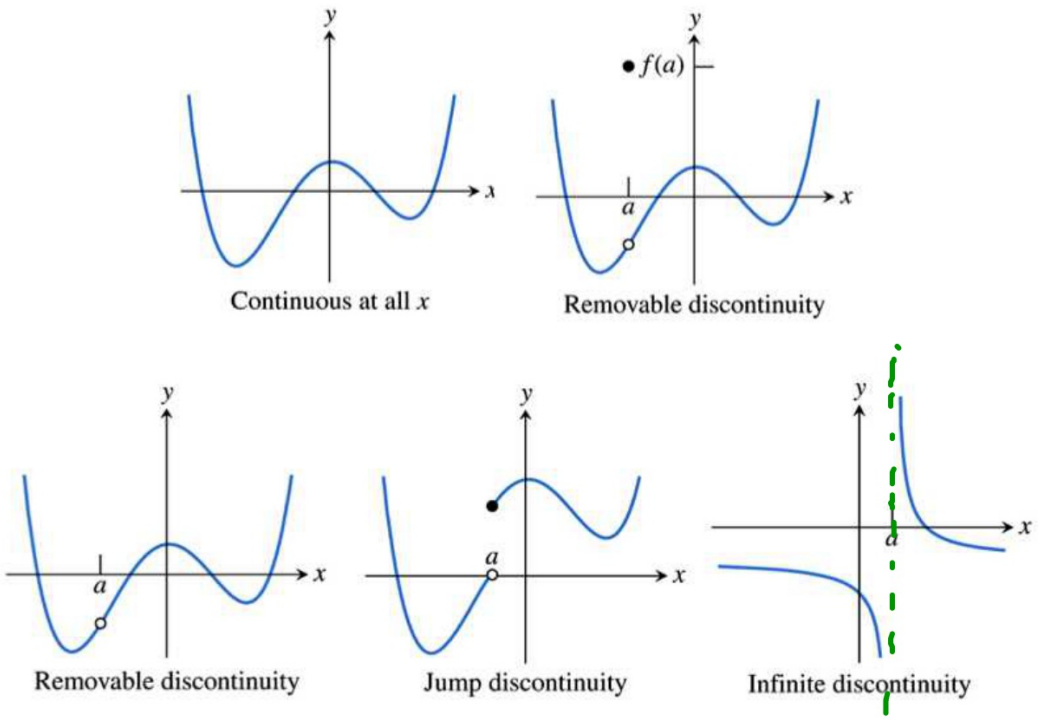
Today's Objectives

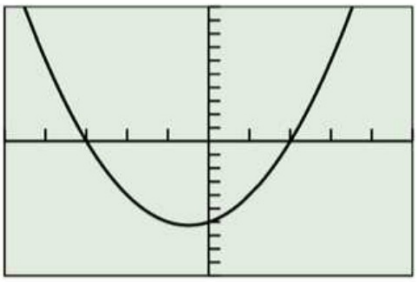
- Orally describe and **evaluate intervals of continuity in functions** and relate to **asymptotes** using key words in small groups.
- Success Criteria
  - Identify different kinds of continuity
  - Define asymptotes and their key features
  - Use graphical representations to justify solutions
- **Vocabulary**: asymptote, continuity, discontinuity

Continuity

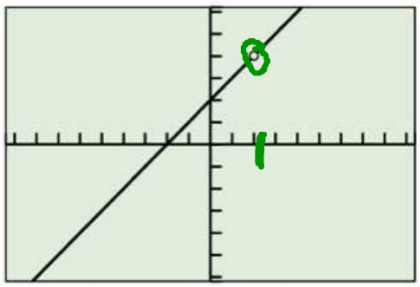


Example Identifying Points of Discontinuity

Which of the following figures shows functions that are discontinuous at x = 2?



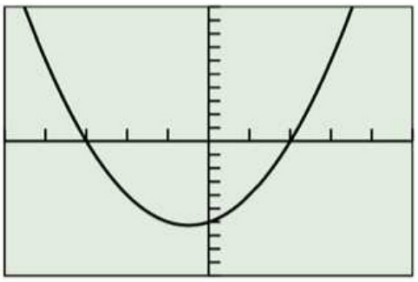
[–5, 5] by [–10, 10]



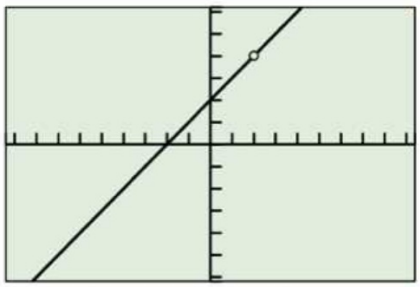
[–9.4, 9.4] by [–6.2, 6.2]

Example Identifying Points of Discontinuity

Which of the following figures shows functions that are discontinuous at $x = 2$?



[–5, 5] by [–10, 10]



[–9.4, 9.4] by [–6.2, 6.2]

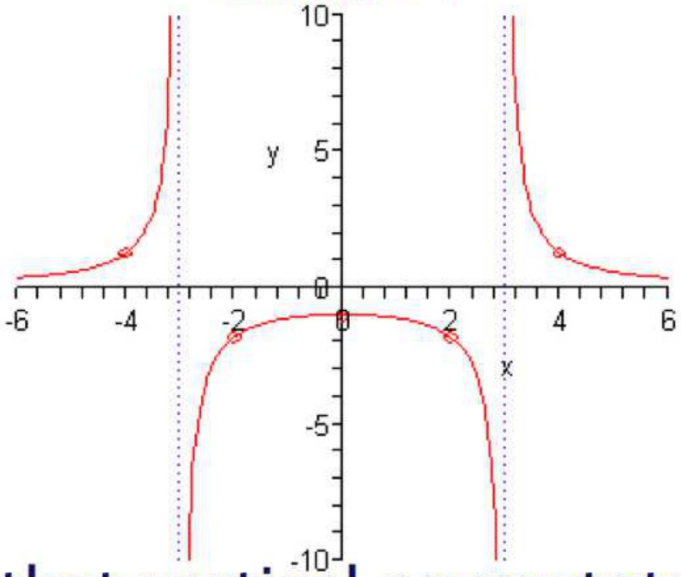
The function on the right is not defined at $x = 2$ and can not be continuous there. This is a removable discontinuity.

Vertical Asymptotes

The line $x = a$ is a vertical asymptote of the graph of a function $y = f(x)$ if $f(x)$ approaches a limit of $+\infty$ or $-\infty$ as x approaches a from either direction.

Vertical Asymptotes appear when we have Infinite discontinuity

Example 1

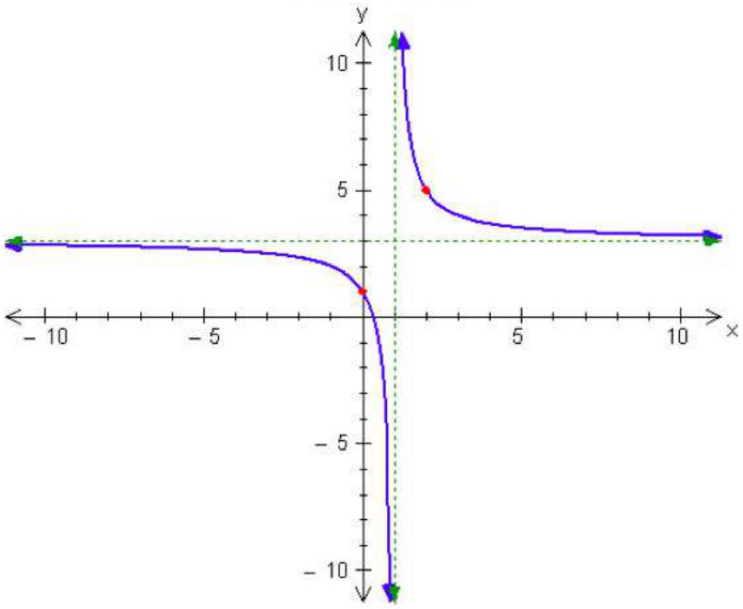


*Notice that vertical asymptotes are examples of infinite discontinuities and are **NOT in the domain.**

Horizontal Asymptotes

The line $y = b$ is a horizontal asymptote of the graph of a function $y = f(x)$ if $f(x)$ approaches a limit of b as x approaches $+\infty$ or $-\infty$.

Example 2



*Notice that horizontal asymptotes are **NOT in the range**

Math Joke

- What is an asymptote's favorite song?

Answer

- Can't touch this!

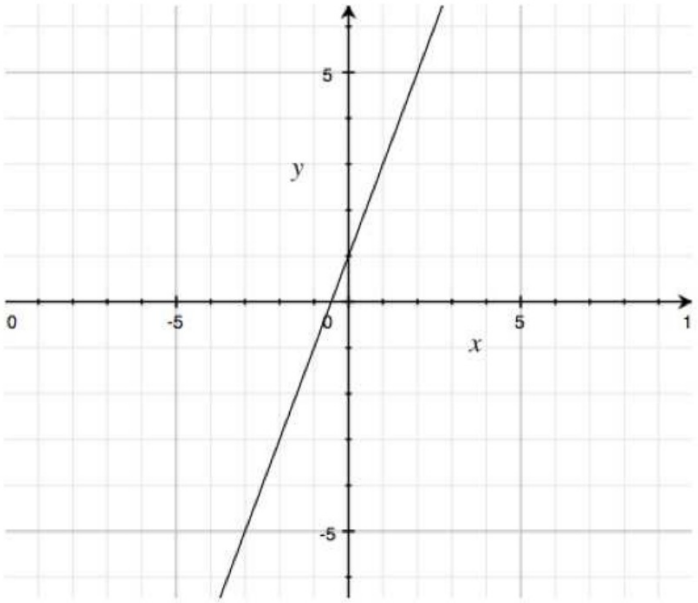
Today's Objectives

- **Determine intervals of increase and decrease for various functions** and write in interval or inequality notation using sentence frames.
- Success Criteria
  - Define increasing, decreasing, and constant
  - Graph functions using graphing utility
  - Use graph characteristics to draw conclusions
- **Vocabulary:** increasing, decreasing, constant

Increasing Function on an Interval

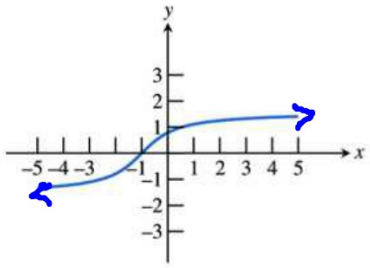
A function f is increasing on an interval if, for any two points in the interval, a positive change in x results in a positive change in f(x).

(As x increases, y increases).



Constant, Increasing and Decreasing Functions

LO: The function is an increasing function because as the input x increases from $-\infty$ to ∞ the functions corresponding output value , y, is getting bigger, going up, increasing all the time.

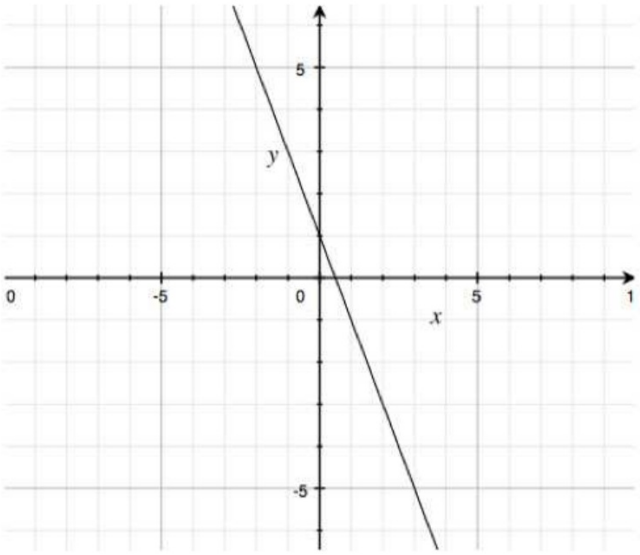


Increasing

Decreasing Function on an Interval

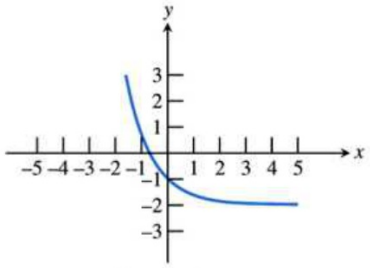
A function f is decreasing on an interval if, for any two points in the interval, a positive change in x results in a negative change in f(x).

(As x increases, y decreases).



Constant, Increasing and Decreasing Functions

LO: The function g(x) is a decreasing function because as the input x increases from $-\infty$ to $+\infty$ the functions output value, y, is getting smaller, going down in values, decreasing all the time.



Decreasing

f(x) ϕ(x)
g(x)
h(x)

Constant Function on an Interval

A function f is **constant** on an interval if, for any two points in the interval, a positive change in x results in a zero change in $f(x)$.

(As x increases, y stays the same).