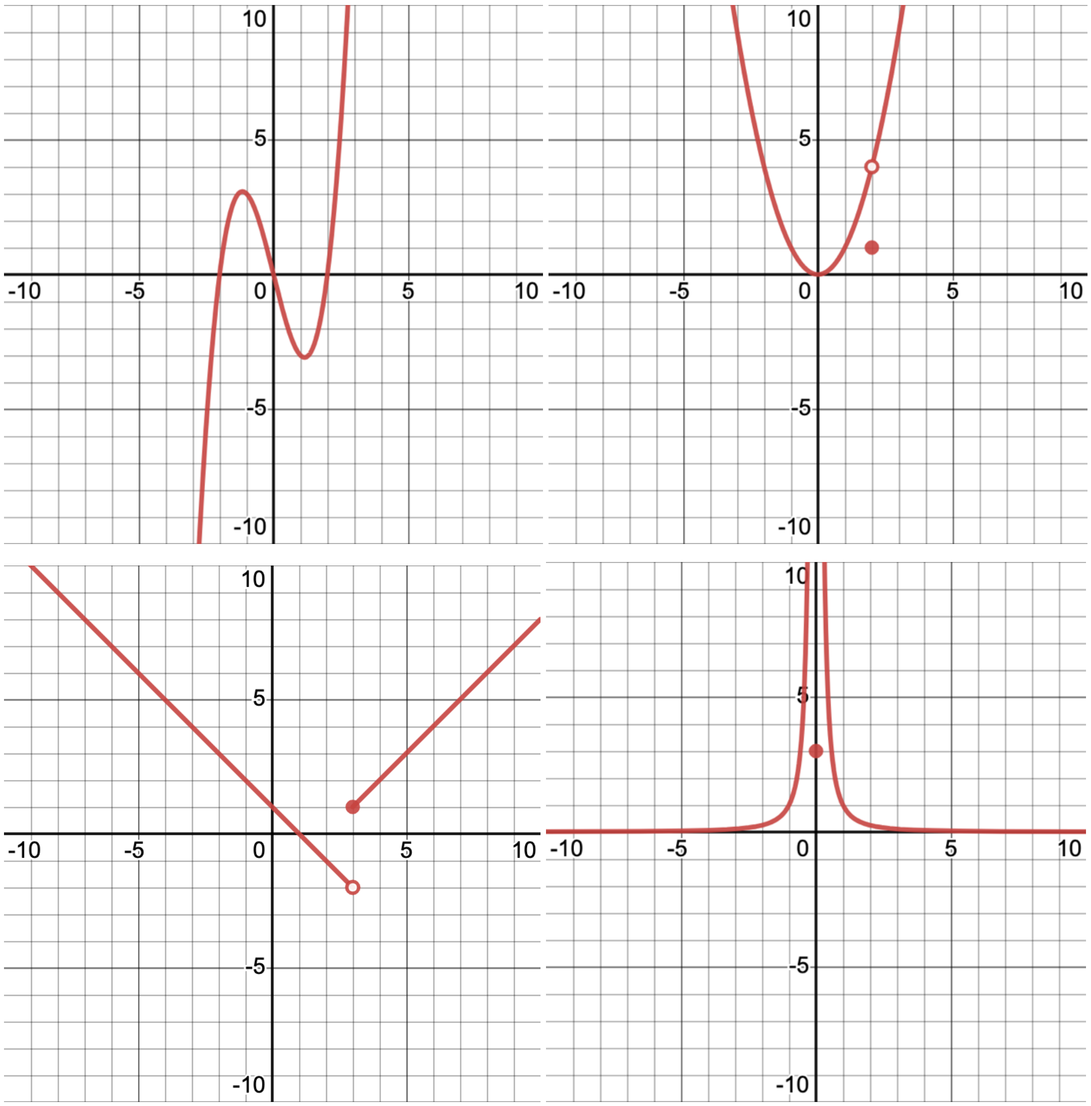
Day 3 - Section 2.4

Notes:

What do these graphs have in common, what is unique about each one?



Let's make a definition:

Three kinds of discontinuities:

Removable:

Infinite:

Jump:

Draw a graph on the grid below of a function with domain (-5,5], a jump discontinuity at x=-2, and a removable discontinuity at x=3.

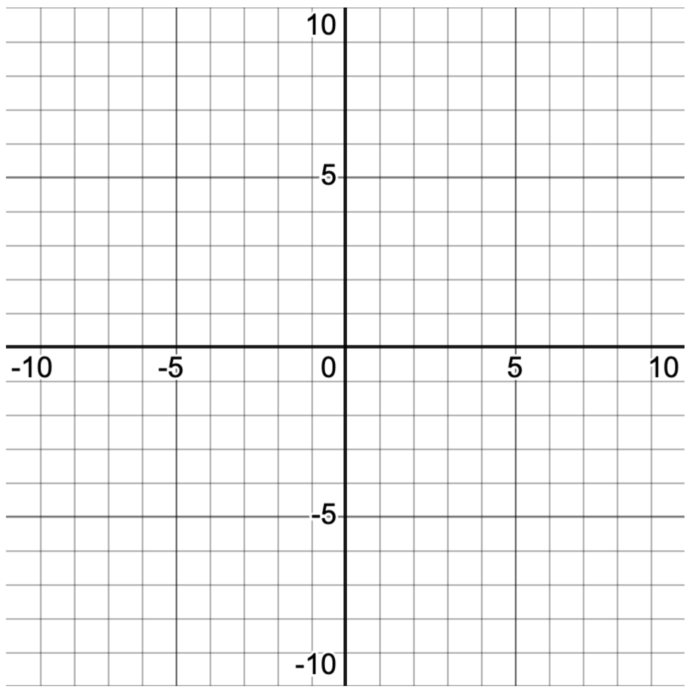


Figure 1: Chart Description automatically generated

Definition of Continuity from the left and the right:

Types of functions that are continuous:

Continuity makes limits easier

Intermediate Value Theorem

Sketch the graph of each function. Use the graph to determine if it is continuous everywhere, or sometimes discontinuous. If there is a discontinuity identify where it is, and describe it as removable, infinite, or jump.

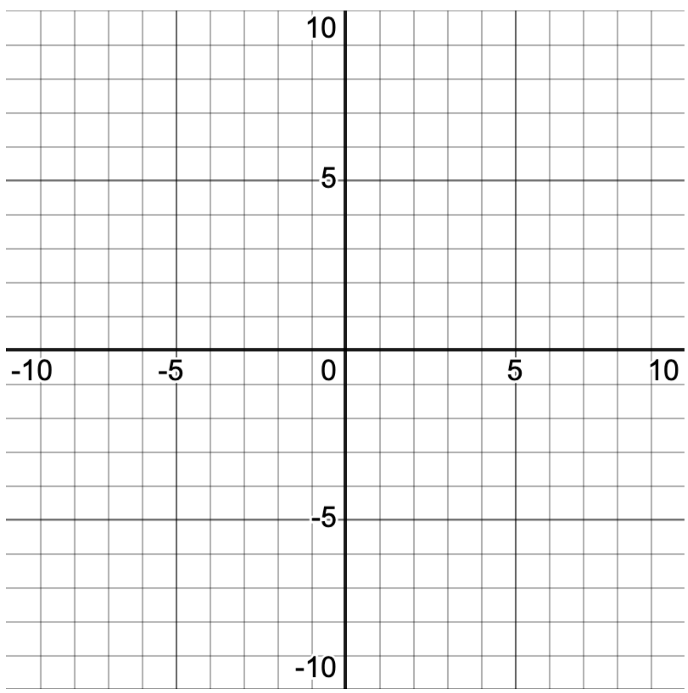
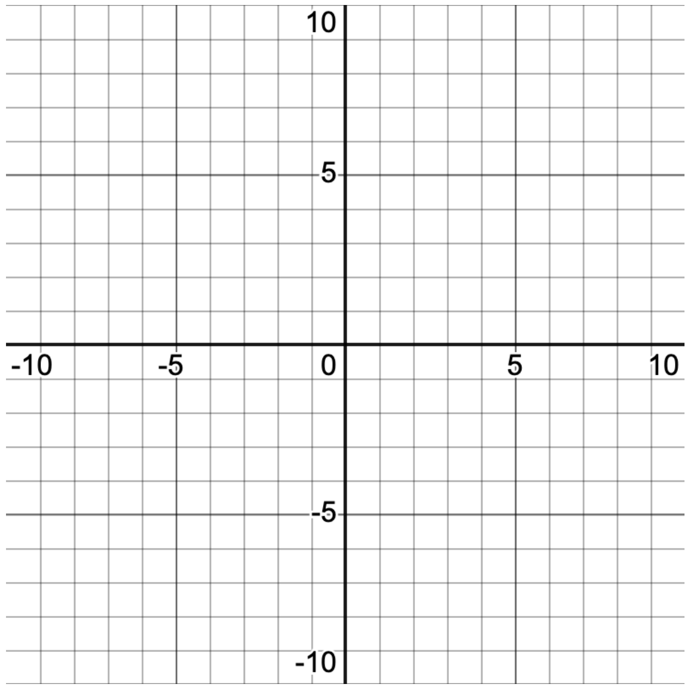
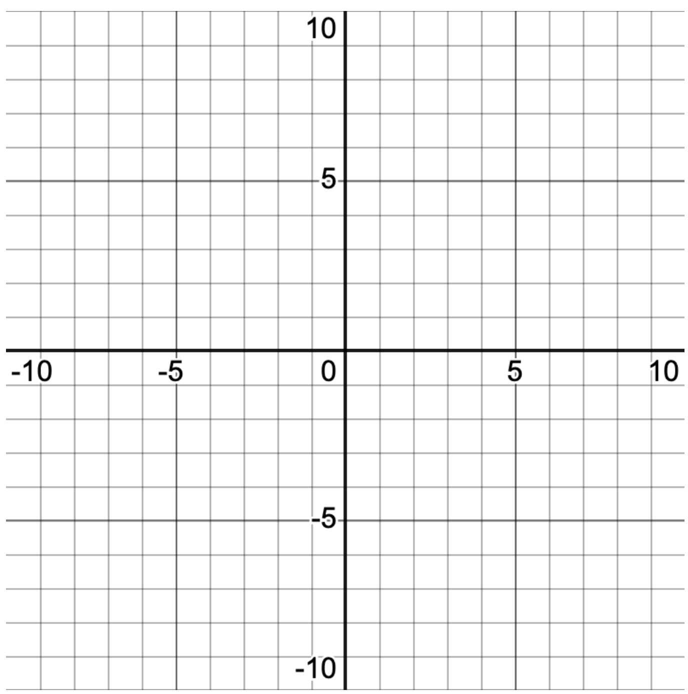


Figure 2: Chart Description automatically generated

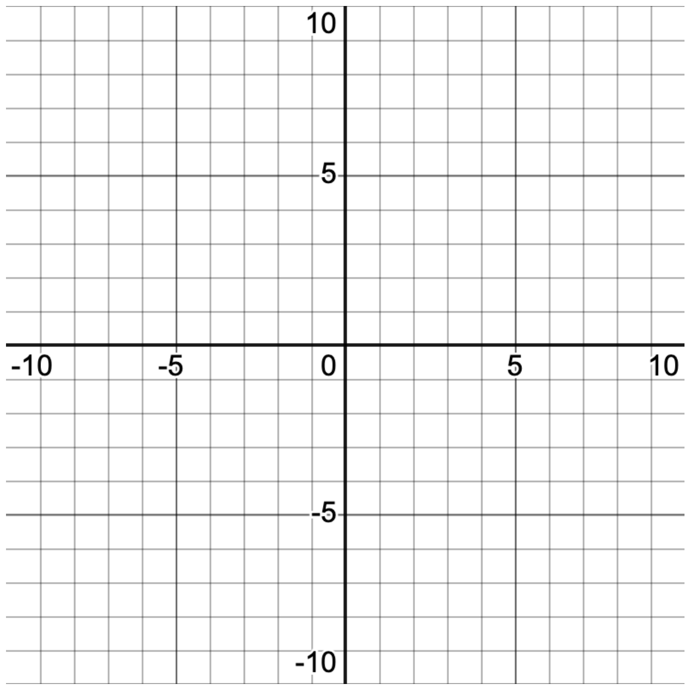
1. $f(x) = \begin{cases} e^x & x < 0 \\ x^2 & x \geq 0 \end{cases}$



2. $f(x) = \begin{cases} \sqrt[3]{x} & x \neq 2 \\ -3 & x = 2 \end{cases}$

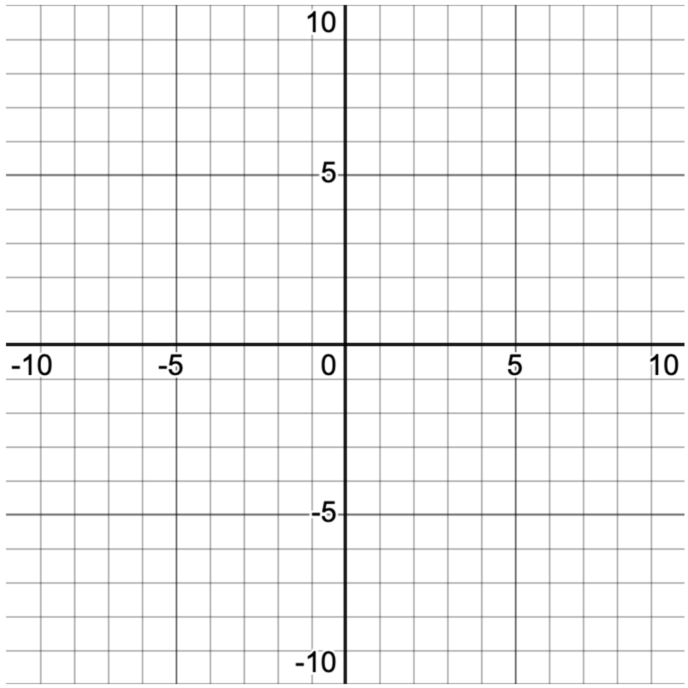


3. $f(x) = \frac{1}{x-3}$



4. $f(x) = (x-3)(x+1)(x+4)$

5. $f(x) = \begin{cases} \sin x & x < 0 \\ x^3 & x \geq 0 \end{cases}$



6. What value of a makes the function $g(x) = \begin{cases} 3x - 1 & x < 2 \\ x + a & x \geq 2 \end{cases}$ continuous everywhere?

7. Use the intermediate value theorem to show that $f(x) = x^3 - 3x^2 + 4$ has a zero.