M211 Recitation Notes Ch. 1

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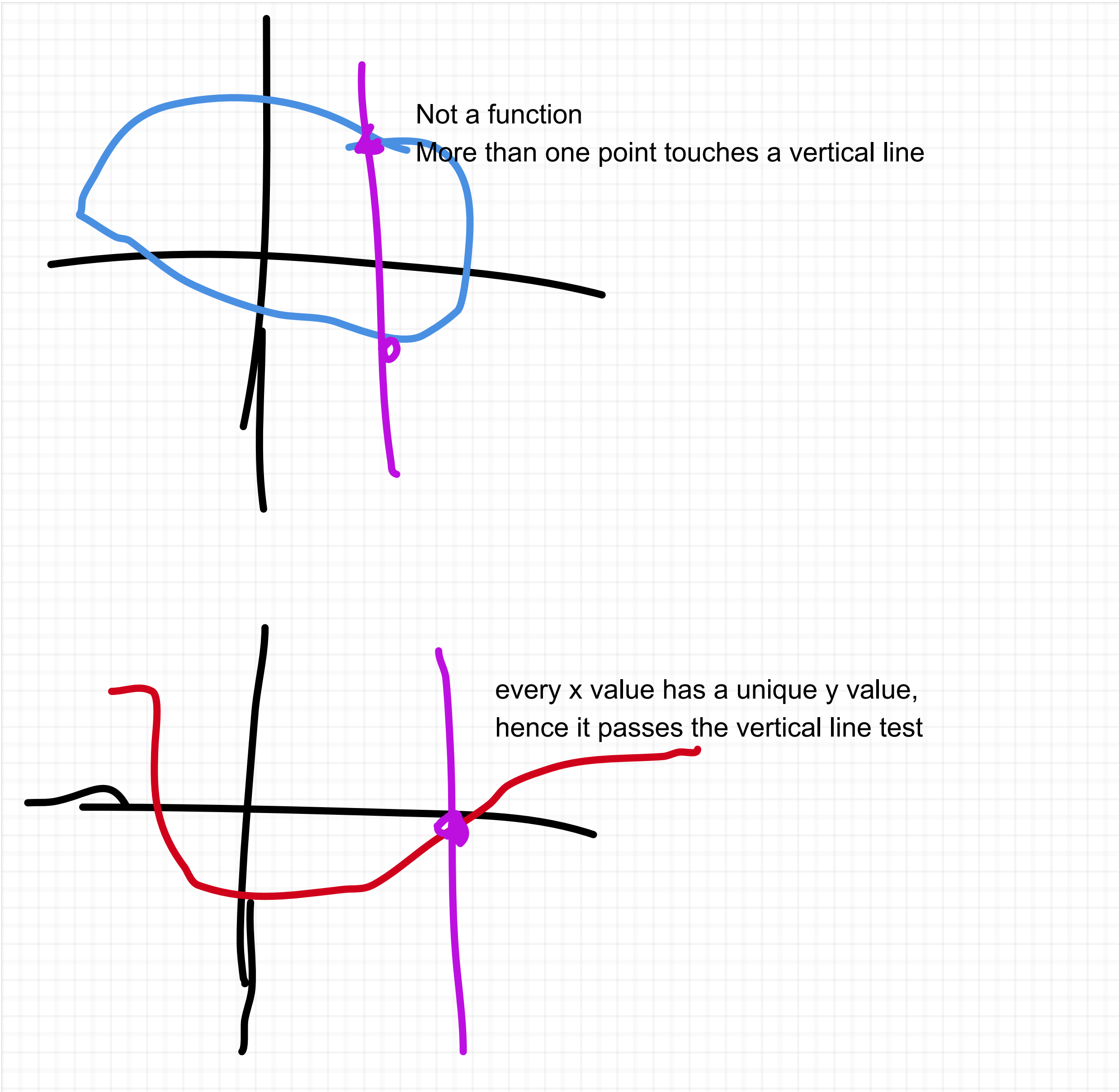
Section 1.1-1.3

1.1 Expostion

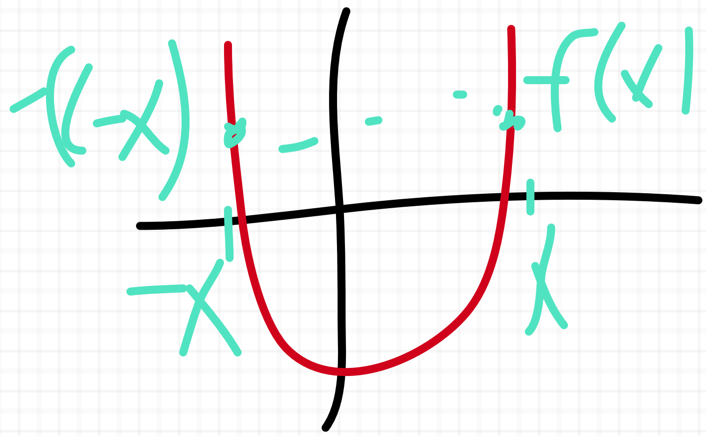
How do we know if a curve is a function?

We know through the **vertical line test.**

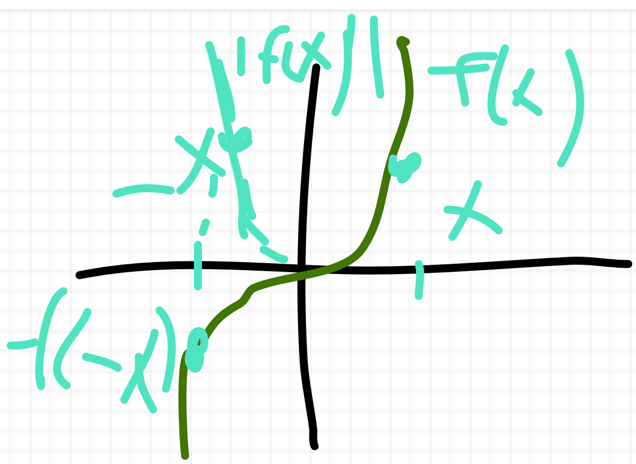


What are some of the types of functions we will encounter in this class?

Even functions: $f(-x) = f(x)$
x^2 is an even function



Odd function: $f(-x) = -f(x)$
x^3 is an odd function



Neither: $f(-x)$ is not equal to $f(x)$ OR $-f(x)$ for SOME x
$|f(-x)| \neq |f(x)|$ for some x
%EDIT NOTE: THIS MAY BE WRONG
$x + 1$

Polynomial Functions:
$P(x) = a_n x^n + a_{n-1} x^{n-1} + \ \cdots \ + a_1 x + a_0$

Power Function:
$f(x) = x^n$

Rational Function:
$f(x) = \dfrac{P(x)}{Q(x)} \quad Q(x) \neq 0$

Algebraic Functions:
Functions constructed using algebraic operations (addition, subtraction, multiplication, division, taking roots)

$\sqrt{x^2 + 1} \qquad \dfrac{x^4 - 16x^2}{x + \sqrt{x}}$

Trigonometric Functions:
Functions involving trig: $\sin x, \ \cos x, \ \tan x, \ \csc x, \ \cot x$

Exponential Functions:
$f(x) = b^x$

Logorithmic Functions:
$f(x) = \log_b x$

1.1-1.2 Homework Questions

WebWork1 Sec1.1Sec1.2 Problem 7. Let
$f(x) = x^3 + 8x^2$ and $g(x) = 3x^2 - 1$

When is f/g undefined

$$f/g(x) = \frac{x^3 + 8x^2}{3x^2 - 1}$$

When is $3x^2 - 1 = 0$?

$3x^2 - 1 = 0$
$\quad +1 \quad +1$
$3x^2 \quad = 1$
$\div 3 \quad \div 3$
$x^2 \quad = 1/3$
$x \quad = \pm\sqrt{1/3}$

$\pm\sqrt{\dfrac{1}{3}}$

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1.1 problem 30 (page 21).

Evaluate the difference quotient for the given function (simplify the answer)

$f(x) = \dfrac{x+3}{x+1}$, find $\dfrac{f(x)-f(1)}{x-1}$

For this problem, you want to plug in the values for the function, and simplify the result once you plug it in

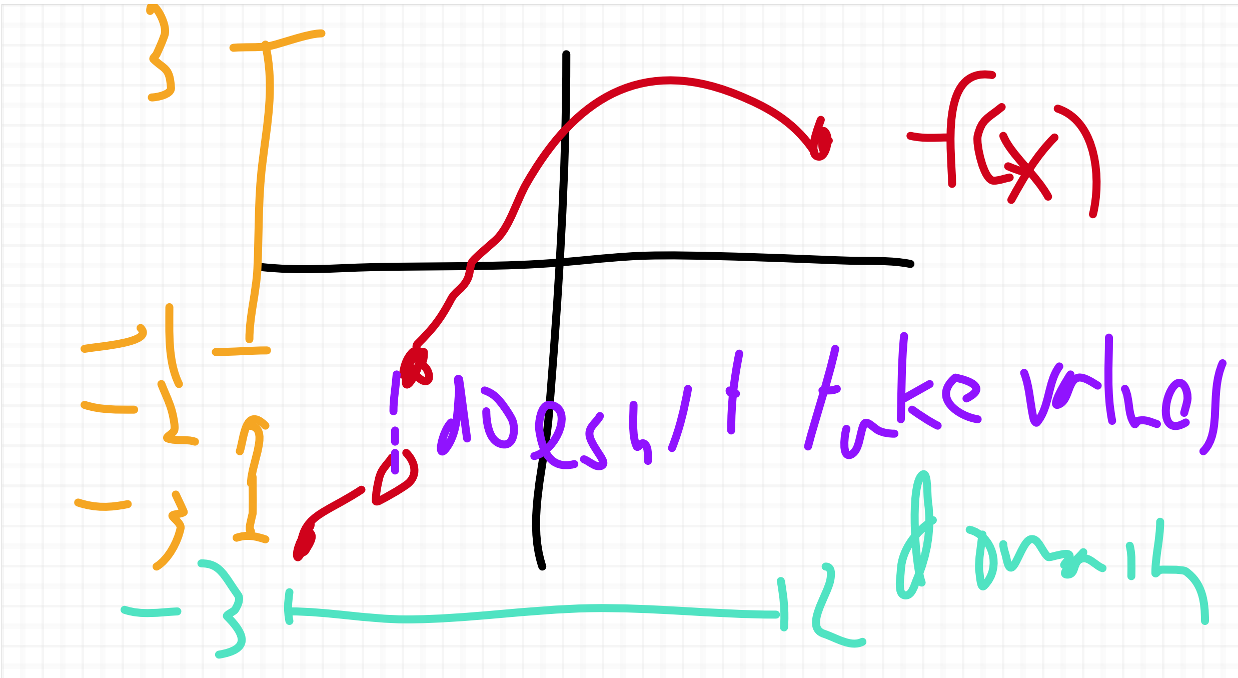
Let's do problem 29.

$f(x) = \dfrac{1}{x}$ and we want to find $\dfrac{f(x)-f(a)}{x-a}$

First we plug the values in

$$\frac{\frac{1}{x}-\frac{1}{a}}{x-a} = \frac{\frac{a-x}{xa}}{x-a} = \frac{a-x}{(x-a)xa} = \frac{-(x-a)}{(x-a)xa} = -\frac{1}{xa}.$$

Sec. 1.1 problem 9 (page 19).



Is $f(x)$ a function?

Yes, it is a function because it passes the vertical line test

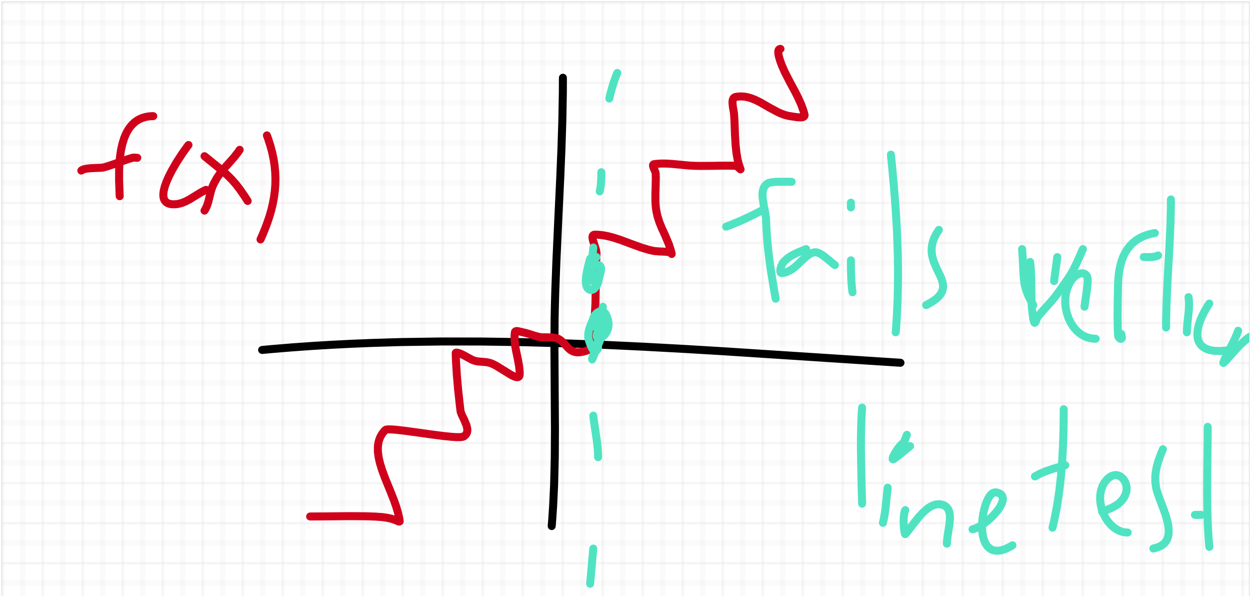
What is the domain and range?

domain: $[-3, 2]$

range:
$[-3, -2) \cup [-1, 3]$

$[-3, -2)$ and $[-1, 3]$
$[-3, -2), [-1, 3]$
$[-3, -2)$ "or" $[-1, 3]$

<u>Sec. 1.1 Problem 10.</u> (page 19)



$f(x)$ not a function.

Section 1.4-1.5

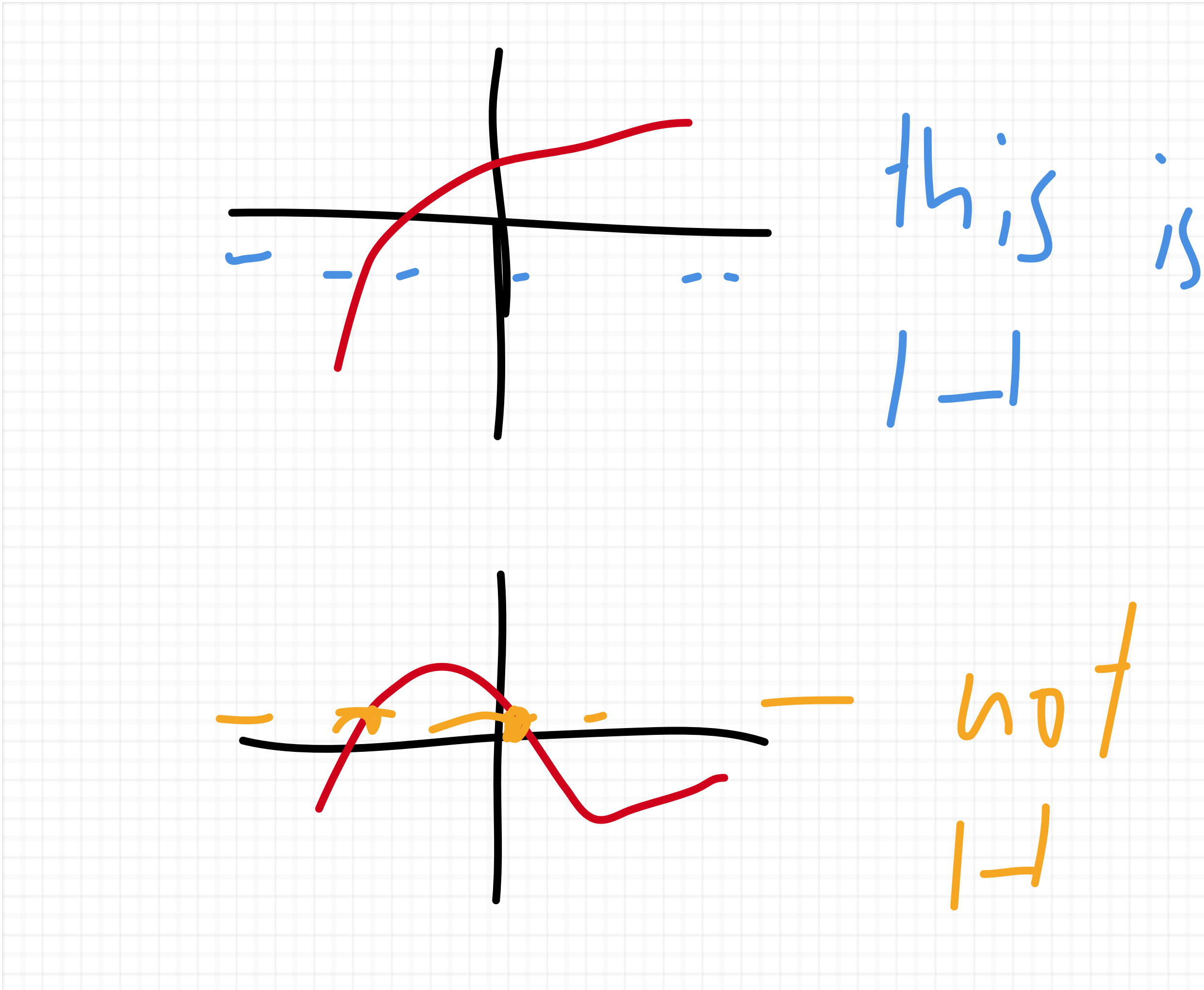
Definition. A function f is one-to-one (1-1) if it never takes on the same value twice; that is

$f(x_1) \neq f(x_2)$ whenever $x_1 \neq x_2$

Given a one-to-one function $f : A \longrightarrow B$ (f has domain A and range B) its inverse function $f^{-1} : B \longrightarrow A$ is defined by

$f^{-1}(y) = x \iff f(x) = y$

we know through horizontal line test



And if a function $f : A \to B$ passes the horizontal line test, then $f^{-1} : B \to A$ exists and passes the vertical line test.

Examples:

$f(x) = x^2$ has domain $\mathbb{R}$ and range $[0, \infty)$ $f^{-1}(x) = x^{1/2}$ has domain $[0, \infty)$ and range $\mathbb{R}$

$f(x) = b^x$ has domain $\mathbb{R}$ and range $(0, \infty)$

How to find inverses?

step 1 switch x and y, write $x = f(y)$

step 2 solve for y in terms of x, that defines f^{-1}.