<u>Linear Algebra MAT313 Spring 2023</u> <u>Professor Sormani</u> Lesson 15

Proofs with Matrices

If it is after March 23, go directly to Lesson 17. You will do this lesson later. Lesson 17 has priority!

Before you start, find your team's project part 2 document and submit one last step for the project.

You will start the group project part 3 after this lesson.

If you work with any classmates on this lesson, be sure to write their names on the problems you completed together.

You will cut and paste the photos of your notes and completed classwork in a googledoc entitled:

MAT313S23-lesson15-lastname-firstname

and share editing of that document with me <u>sormanic@gmail.com</u>. You will also include your homework and any corrections to your homework in this doc.

If you have a question, type **QUESTION** in your googledoc next to the point in your notes that has a question and email me with the subject MAT313 QUESTION. I will answer your question by inserting a photo into your googledoc or making an extra video.

Today we have two parts:

Part I teaches basic proofs and has five required HW problems

Part II (extra credit required for math majors)
uses sum notation for proofs and has extra credit problems

Part I: Watch Playlist 313F20-15-Partl

Lesson on Proofs with Matrices

In this (esson we will prove:

Thm Distribution of Matrix Multiplication

A*(B+C) = A*B + A*C

Thm Associatity of Matrix Multiplication

A*(B*C) = (A*B) * C

Defo: The zero matrix, O, is a matrix

which has zeroes everywhere.

Thm A*O=? and O*A=?

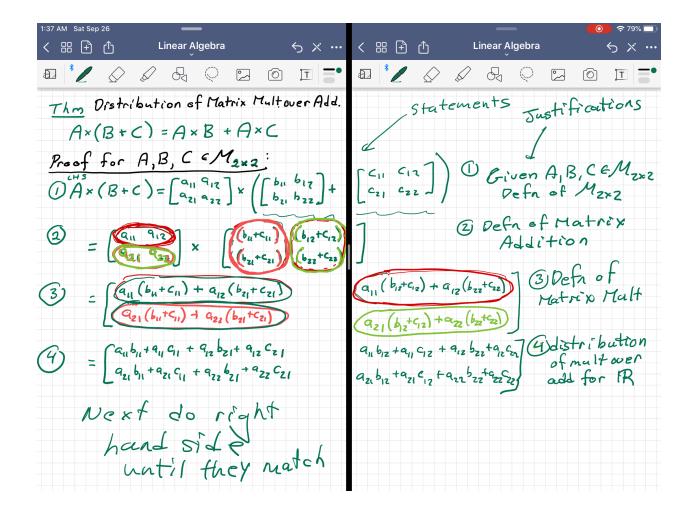
Defo The identity matrix, I, is a
is a square matrix with l's

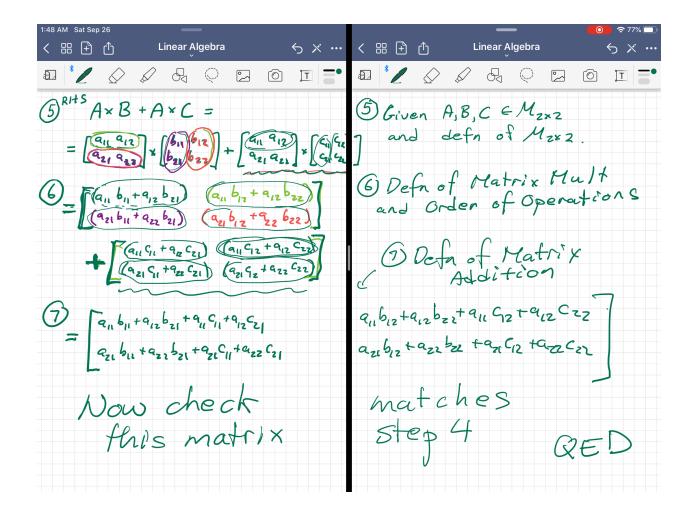
on the diagonal and zeroes elsewhere.

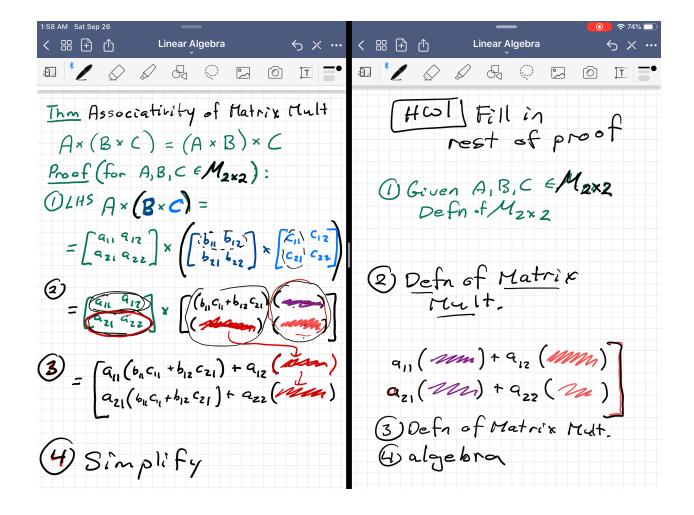
Thm A*I=? and I*A=?

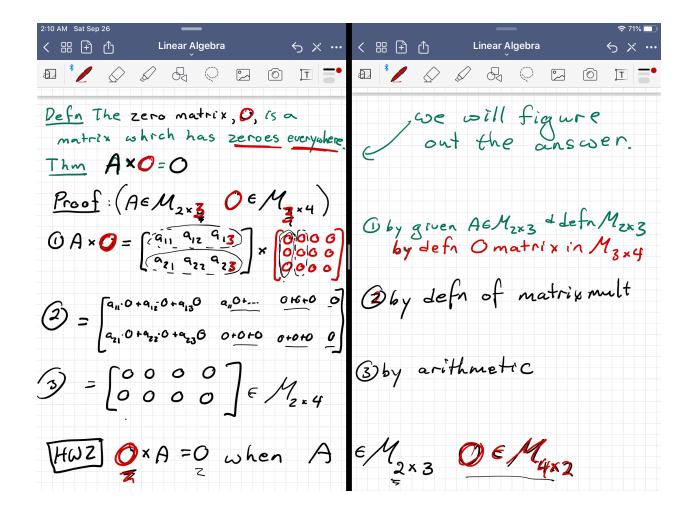
What about

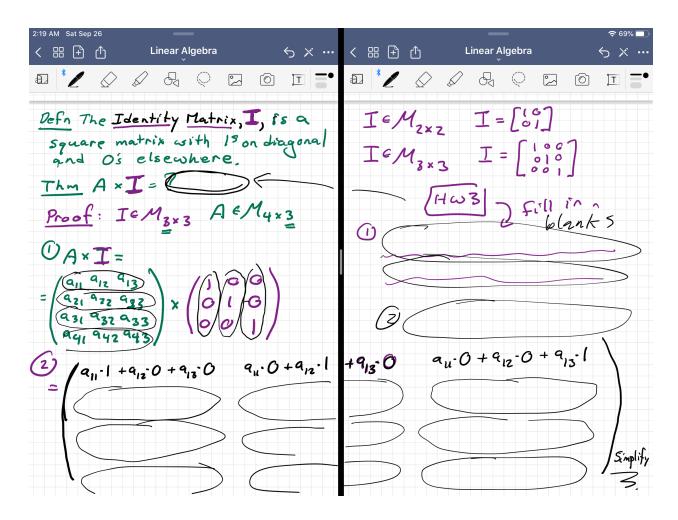
A*B = B*A?









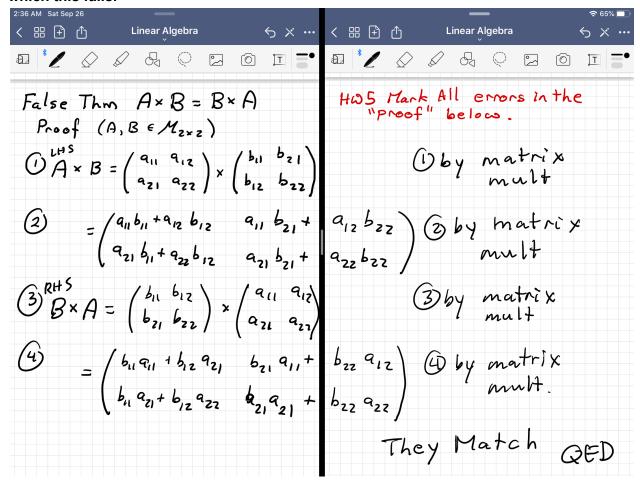


HW1-HW3 are described above.

HW4 Prove IxB=B when B is 2x4 and I is the correct choice of identity matrix.

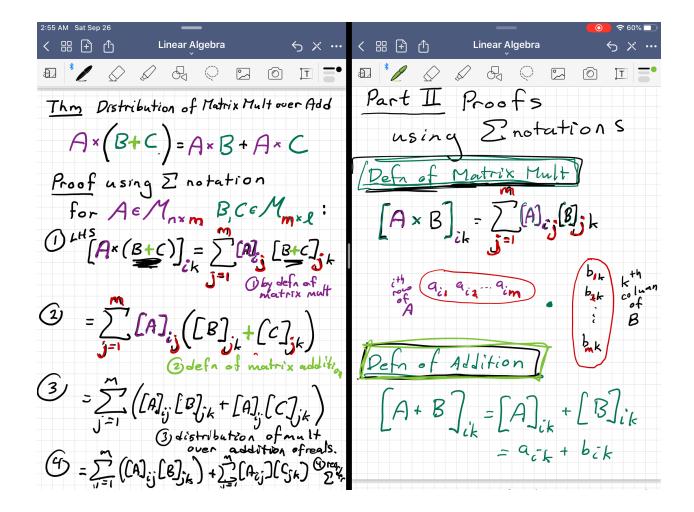
HW5 is to find the errors in the incorrect proof below which has many errors so find all of the errors. Then either fix the proof or find a pair of specific 2x2 matrices A and B for

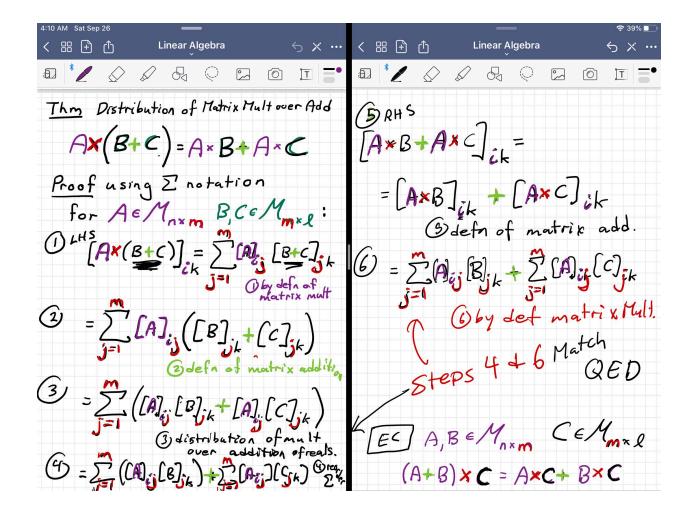
which this fails.

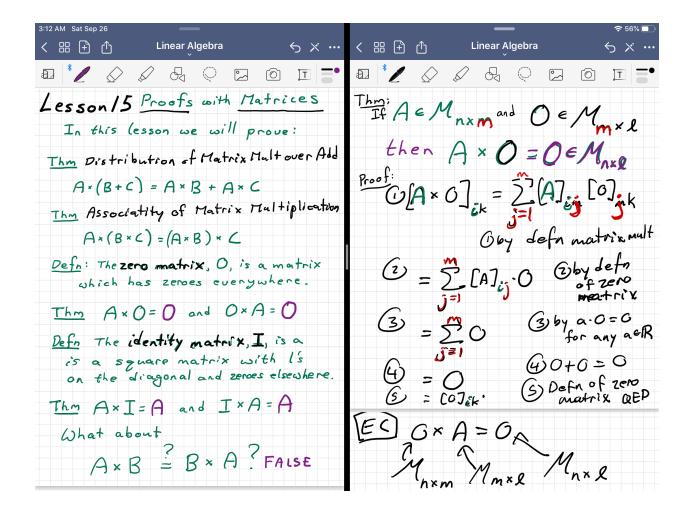


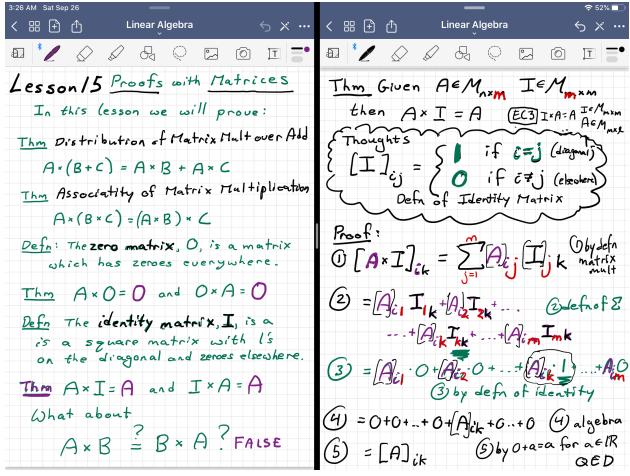
Part II: Watch <u>Playlist 313F20-15-PartII</u> which is Extra Credit highly recommended for math majors and has three extra credit problems.

6 x ... 〈 器 🕀 凸 Linear Algebra < 器 🕀 🗅 Linear Algebra Lesson on Proofs with Matrices Part II Proofs In this lesson we will prove: Thm Distribution of Matrix Multover Add A*(B+C) = A × B + A × C Thm Associatity of Matrix Multiplication A * (B * C) = (A * B) * C Defn: The zero matrix, O, is a matrix which has zeroes everywhere. Thm AxO= ? and OxA=? Defo The identity matrix, I, is a is a square matrix with l's on the diagonal and zeroes elsewhere. Thm AxI=? and IxA=? What about A * B = B * A?









Extra Credit: Prove for arbitrary matrices A and B and vector v using sum notation that A(Bv)=(AxB)v

Extra Credit: Prove for arbitrary matrices A, B, and C using sum notation that Ax(BxC)=(AxB)xC