

#flo #inclass

## 1 | determinant! for realsies.

determinant of 2x2 matrix

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

**ad-bc**determinant  $|a| = a$ 

|| around something: generally the size. applies to magnitudes, absolute value, and cardinality. and de

### 1.0.1 | new method

[ a<sub>11</sub> ..... a<sub>1n</sub> ] . | . | . | . | [ a<sub>n1</sub> ..... a<sub>nn</sub> ]

choose a row or a column and expand along it. any row, any column choose each element and multiply it by the submatrix??

**Multiply each element in any row or column of the matrix by its cofactor.** The sum of these products gives the value of the determinant. – google

1 1 -1 2 0 2 1 3 -2

choose middle row: first 2x2 det: -1 [ 2 2 1 -2 ]

second: 1 -1 1 -2 \* 0

third: 1 -1 2 2 \* 3

take the determinant of each submatrix

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use alternating coefficients!!

pos, neg, pos, ect.

### 1.0.2 | why?

make a torus! to do this to a plane: glue the top to the bottom to make a tube, then connect the ends of the tube many games operated on a torus – come out the left, go into the right

think of our matrix as operating on a torus: if you come out, you just come back in and uh, what?

title: proof by induction

prove something is true for the base case

prove that it's true for n+1.

like a domino proof:

make sure all the dominoes will hit the next one

then hit the first domino

determinant: definition by induction?

### 1.0.3 | **cross product**

inp: 3x1 vectors

[a,b,c] [d,e,f]

$$\begin{bmatrix} i & j & k \\ a & b & c \\ d & e & f \end{bmatrix}$$

then you just take the determinant:

$$\bullet i * (bf - ce) - j(af - cd) + k(ae - bd)$$

### 1.0.4 | **questions**

- do matrices always have an inverse?
  - what about the all zero matrix?
- **what is a geometric interpretation of the cross product?**
  - use it to find a plane containing two given vectors
  - did this one!
- properties of the determinant
  - why ||?
  - why torus version?
  - |a b| = ?

### 1.0.5 | **ending review**

what is cos? adjacent/hypotenuse when looking at a right triangle.. dont have a right triangle? make one!

dot product: gives you the length of a projection of a vector onto the other one

selina's proof!