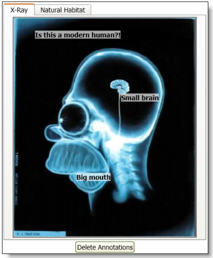
Solidify & Make Connections: Problem Sets 30%

- alone or in a group of 2 people. turn in one per group—to one of your accounts. each group must complete their own and in their own words. last question—acknowledge any sources or people, aside from your partner or me:
  a) Disclosure Acknowledgment ☺ or Formal Citations
  b) Look Back Annotation, c) 1 PDF in 1 ASULearn
- annotations/explanations of by-hand + Maple work using only what we have covered so far and in the language of our course



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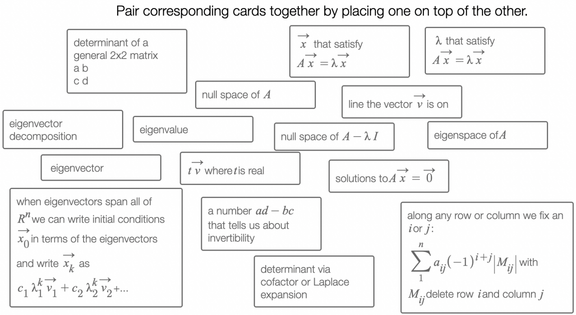
Card Sort 4

I asked you to select one or more pairings from the card sort I created and prepare to briefly report back in some way.

Share with your group (for example, you could comment on what most interested, challenged or surprised you, or what you had a question on) and prepare to share something from your group's discussions with the class when we come back together



Think-Share-Pair-Compare #1

1. Which of the following are true about the matrix $A = \begin{bmatrix} 1 & 0 \\ k & 1 \end{bmatrix}$

   a) determinant of A is 1

   b) A is a vertical shear matrix

   c) When we multiply $AB_{2\times n}$ then we have applied $r_2' = kr_1 + r_2$ to B, because A is the elementary matrix representing that row operation

   d) all of the above

   e) two of the above

Respond on our usual pollev if you have tech.

Think-Share-Pair-Compare #2

2. Which of the following statements is true?
   a) If a square matrix has two identical rows then its determinant is zero.
   b) If the determinant of a matrix is zero, then the matrix has two identical rows.
   c) both
   d) none of the above

Respond on our usual pollev if you have tech.

Think-Share-Pair-Compare #3

3. A reflection matrix acting on $\mathbb{R}^2$ has eigenvalue(s)

a) $\lambda = 1$ on the line of reflection

b) $\lambda = -1$ perpendicular to the line of reflection

c) $\lambda = -2$ for some line

d) all of the above

e) two of the above

Respond on our usual pollev if you have tech.

Think-Share-Pair-Compare #4

4. In Maple we execute

A := Matrix([[11/390,238/195],[-17/78,47/39]]);

Eigenvectors(A); $\begin{bmatrix} \frac{1}{3} \\ \frac{9}{10} \end{bmatrix}, \begin{bmatrix} 4 & \frac{7}{5} \\ 1 & 1 \end{bmatrix}$

Say that *A* represents the changes from one year to the next in a system of foxes (*x*-value) and rabbits (*y*-value). For most initial conditions, what happens to the system in the longterm?

Discuss and prepare to share when I bring us together.

Review Practice 4 #1

In the review 4 practice quiz you were to review and solidify the language of linear algebra as well as computations and conceptual understanding as you responded in your notes.

1. In Maple, I input with(LinearAlgebra): M:=Matrix([[1/2,0,0],[1,1/3,0],[0,1,2]]): Eigenvectors(M);

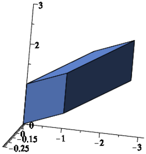
and obtain $\begin{bmatrix} 2 \\ \frac{1}{3} \\ \frac{1}{2} \end{bmatrix} \begin{bmatrix} 0 & 0 & -\frac{1}{4} \\ 0 & -\frac{5}{3} & -\frac{3}{2} \\ 1 & 1 & 1 \end{bmatrix}$. Using the cofactor/Laplace expansion method, calculate by hand the determinant of the 3×3 matrix of eigenvectors.

Compare and contrast your responses with your group.

Review Practice 4 #1 continued

Here is a plot of the parallelepiped of the eigenvectors $\begin{bmatrix}0\\0\\1\end{bmatrix}$, $\begin{bmatrix}0\\-\frac{5}{3}\\1\end{bmatrix}$, and $\begin{bmatrix}-\frac{1}{4}\\-\frac{3}{2}\\1\end{bmatrix}$ with the $-x$ axis sticking out of the computer screen, the z axis pointed up, and the $-y$ axis to the right!

- What is the volume of the parallelepiped formed by these eigenvectors?



- Why do these 3 eigenvectors span all of $\mathbb{R}^3$?

Compare and contrast your responses with your group.

Review Practice 4 #1 continued

- Now that you have argued why the eigenvectors span all of $\mathbb{R}^3$, in your notes, write the eigenvector decomposition for a dynamical system with the same state matrix M, eigenvalues, and eigenvectors as above.
- What happens in the long run to populations on the $t\begin{bmatrix} 0 \\ -\frac{5}{3} \\ 1 \end{bmatrix}$ line?
- What happens in the long run to populations with starting positions on the z-axis?
- What happens in the long run to populations for most starting positions?
- In your notes, sketch a trajectory diagram in 3-space with a starting position not on any of the 3 eigenvectors.

Compare and contrast your responses with your group.

Review Practice 4 #2

2.

- list a few examples of important algebraic operations and properties in 2240.
- list a few examples of important visualizations in 2240.
- list a few examples of real-life applications that we have looked at.
- It should hopefully be fairly clear why algebra, geometry and applications are a focus of this course but why do you think critical reasoning and analysis is also one of the focuses?

Compare and contrast your responses with your group.

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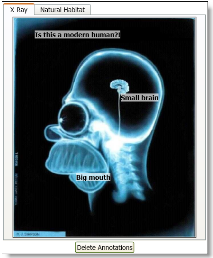

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