Discussion – June 28

1. Multiply, if possible:

(a) $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}\begin{pmatrix} 2 & 3 & 5 \\ 7 & 11 & 13 \end{pmatrix}$ (b) $\begin{pmatrix} 1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} \end{pmatrix}\begin{pmatrix} 1/\sqrt{2} & 1/\sqrt{2} \\ -1/\sqrt{2} & 1/\sqrt{2} \end{pmatrix}$

(c) $\begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} 2 & 3 & 5 \\ 7 & 11 & 13 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & 7 \\ 3 & 11 \\ 5 & 13 \end{pmatrix}\begin{pmatrix} 1 & 4 \\ 2 & 9 \end{pmatrix}$

2. $A = \begin{pmatrix} 2 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & -1 \end{pmatrix}$. Compute A^TA.

3. A is 4x4, with $a_{ij} = i^{j-1}$ (assume $k^0 = 1$ for any k). Compute $(A^TA)_{2,3}$ with the least work possible.

4. Compute the inverse matrix for $A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 4 \\ 1 & 3 & 9 \end{pmatrix}$.

(This matrix, for $f(n) = x_1 + x_2 n + x_3 n^2$, computes $A\vec{x} = \begin{bmatrix} f(1) \\ f(2) \\ f(3) \end{bmatrix}$. See if you can understand why.)

Triangular numbers are 1, 3, 6, 10, ...

Compute $A^{-1}\begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix}$ (to get a polynomial for the closed form of this sequence).

5. What is the inverse of I_n?

6. Come up with an A for each quadrant of having/not having a left/right inverse.

7. Elementary row operations act column-by-column. (↑ they are transformations) Find the matrices for the following row operations: (4 rows)

(a) $R_2 \leftrightarrow R_3$ (b) $2R_3 \to R_3$ (c) $R_3 + 7R_1 \to R_3$

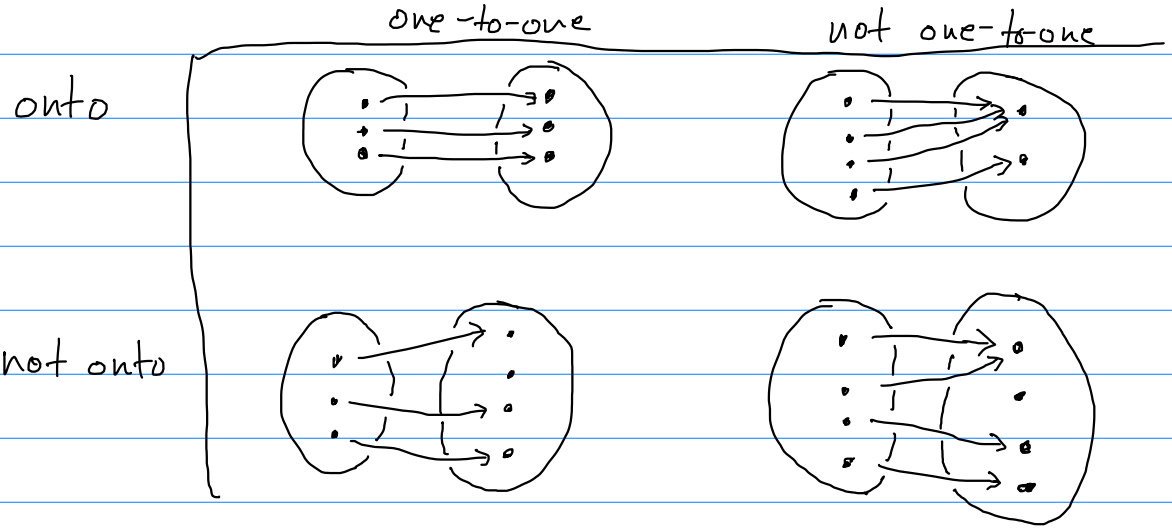
(d) $R_1 - 6R_4 \to R_1$

Compute their inverses by some means.

8. H_2 and O_2 combine to form H_2O. Write a linear dependence.

domain → codomain

for a function between finite sets:



In my house, if x and y are cats, then x and y are the same cat.

What are the possible numbers of cats in that house?

If x is a cat, my cat Scruffles knows x.

What are the possible numbers of cats Scruffles knows?

If x is a cat which has been in my backyard, x is a tabby cat.

How is this a metaphor for independent vectors?