Homework #4

Due Monday 7 February, 2022 at 11:59pm.

Submit as a single PDF via Gradescope, linked from the Canvas page
canvas.alaska.edu/courses/7017
Textbook Problems from Strang, *Intro Linear Algebra*, 5th ed. will be graded for completion. Answers/solutions are linked at
bueler.github.io/math314/resources.html
P Problems will be graded for correctness.

Put these Textbook Problems first on your PDF, in this order.

from Problem Set 2.4, pages 77–82: # 1, 2, 5, 15, 23, 32

from Problem Set 2.5, pages 92–96: # 6, 11, 12, 16, 18, 25, 29, 34

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*Put these **P** Problems next on your PDF, in this order.*

P17. Assume A and B are square matrices of the same size. Which of the following matrices are guaranteed to equal $(A+B)^2$?

$$A^2+B^2, \quad A^2+2AB+B^2, \quad A(A+B)+B(A+B), \quad A^2+AB+BA+B^2$$

Explain why if so, and provide a counter-example if not. (*Hint: When not equal, either* 1×1 *or* 2×2 *counterexamples will suffice.*)

P18. If A is $m\times n$, how many multiplications are needed when

(a) A multiplies a column vector $\boldsymbol{x}$ of size n?

(b) A multiplies an $n\times k$ matrix B?

(c) A multiplies itself to produce A^2, in the case where $m=n$?

P19. Use the Gauss-Jordan method to calculate A^{-1} when

$$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$$

(*That is, eliminate above and below the pivots as you convert* $\begin{bmatrix} A & I \end{bmatrix}$ *to* $\begin{bmatrix} I & A^{-1} \end{bmatrix}$, and show your steps.) Check your result using Matlab's `inv()` command.

P20. There are sixteen 2×2 matrices whose entries are 0's and 1's only. How many of the 16 are invertible?