Elementary Matrices

Outline: Multiplying by certain matrices has the effect of doing row operations; several row operations can be done by doing one mtx multiplication.

Example 1. Let A be a 3 by 3 mtx.

Q: Can you think of a 3 by 3 mtx E s.t. EA equals the mtx obtained by multiplying row2 of A by 5?

Hint: Let A be I. On the one hand, $EI = E$. On the other hand, we can figure out what EI is by thinking about what E "does to" I.

Q: Can you think of a 3 by 3 mtx E s.t. EA equals the mtx obtained by doing row3=row3+5row1 on A? The book calls this matrix E_{31}. (Do not confuse with the (3,1)-entry.)

Q: Can you think of a 3 by 3 mtx P s.t. PA equals the mtx obtained by switching row2 and row3 of A? It's called a **permutation** matrix; it permutes (switches) rows. Let's call this mtx $P_{2,3}$; can we also call it $P_{3,2}$? Sure; no difference.

Q: Can you think of a 3 by 3 mtx B s.t. BA equals the mtx obtained by first switching row2 and row3 of A and then multiplying row2 by 5? Does the order of the operations matter? A: Yes it does.

T or F: For every m by n mtx A, there exists a mtx B s.t. BA is upper triangular. A: True. Why?

HW

Read sec 2.3. Preview section 5.1.

Do: p. 50: 1,2,3,20,22.

Always prove or explain all your answers, even if the book doesn't ask for it!