Review defs: $A_{i,j}$;.

Outline of sec 2.7:
1. The definition of the transpose of a mtx. **2**. Symmetric mtxs. **3**. Properties of the transpose.

Note: We are skipping factorization of mtx for the time being.

Informal definition of the transpose of a mtx: Turn every row into a col, and vice versa. (Or: rotate the rectangle around its diagonal.)

Notation: traspose of A is written as: A^T (A' in Matlab.)

Examples: ...

Definition 1. The **transpose** A^T of a mtx A is defined by: the ijth entry of A^T is the jith entry of A; i.e.,

$$(A^T)_{i,j} = A_{j,i}$$

Q: If A is an m by n mtx, then A^T is a ? by ? mtx? Ans: n by m.

Q: What's the transpose of a row vec? A: a col vec.

Q: What's the transpose of the traspose of a mtx — $(A^T)^T$ =? Ans: A itself. (Rotate around diagonal twice.)

Q: What is the transpose of the identity mtx? A: itself.

Q: Can you think of any other mtxs A s.t. $A^T = A$?
A: Yes. Any mtx that's symmetric w.r.t. its diagonal.

Definition 2. A mtx A is called **symmetric** if $A^T = A$.

Q: If an m by n mtx is symmetric, what can we say about m and n? A: m=n.

Theorem 1. $(AB)^T = B^T A^T$.

Proof is not very hard. But we'll skip it (challenge problem). Find your own proof, or see p. 99.

Corollary 2. $(A^{-1})^T = (A^T)^{-1}$.

Proof. $AA^{-1} = I$ (why?),
so $(AA^{-1})^T = I^T$,
so (by above theorem), $(A^{-1})^T A^T = I$,
so $(A^{-1})^T$ and A^T are inverses of each other,
so the inverse of A^T is $(A^{-1})^T$,
which means $(A^T)^{-1} = (A^{-1})^T$. □

Block Matrices: handwritten notes

HW:
Read sec 2.7, p. 57-58 (up to example 3). Preview sec 2.3.
Do p. 95: 1b,[2],3,4,7bcd; p. 64: 34; Ch: 35.

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