

# Lecture 20

## Some parting thoughts . . .

- linear algebra
- levels of understanding
- what's next?

# Linear algebra

- comes up in *many* practical contexts (EE, ME, CE, AA, OR, Econ, . . . )
- nowadays is readily *done*  
cf. 10 yrs ago (when it was mostly *talked about*)
- Matlab or equiv for fooling around
- real codes (*e.g.*, LAPACK) widely available
- current level of linear algebra technology:
  - 500 – 1000 vbles: easy with general purpose codes
  - much more possible with special structure, special codes (*e.g.*, sparse, convolution, banded, . . . )

# Levels of understanding

## Simple, intuitive view:

- 17 vbles, 17 eqns: usually has unique solution
- 80 vbles, 60 eqns: 20 extra degrees of freedom

## Platonic view:

- singular, rank, range, nullspace, Jordan form, controllability
- everything is precise & unambiguous
- gives insight & deeper understanding
- sometimes misleading in practice

## Quantitative view:

- based on ideas like least-squares, SVD
- gives numerical measures for ideas like singularity, rank, etc.
- interpretation depends on (practical) context
- very useful in practice

- must have understanding at one level before moving to next
- **never forget** which level you are operating in

# What's next?

- EE363 — linear dynamical systems (Win 08-09)
- EE364a — convex optimization I (Spr 08-09)

(plus lots of other EE, CS, ICME, MS&E, Stat, ME, AA courses on signal processing, control, graphics & vision, adaptive systems, machine learning, computational geometry, numerical linear algebra, . . . )