

In The Name of God.  
The Merciful, The Compassionate.

# Positive Definite Matrices, Minima, Ellipsoids, and Similar Matrices

notes on Gilbert Strang videos, Lecture 27,28

## 1 Positive Definite Matrices

- Positive Definiteness Test:  $A = \begin{bmatrix} a & b & c \end{bmatrix}$ 
  1. Eigen values must be greater than zero  $\lambda_1 > 0, \lambda_2 > 0$
  2. Sub-determinants should be greater than zero:  $a > 0, ac - b^2 > 0$
  3. Pivots should be greater than zero:  $a > 0, \frac{ac-b^2}{a} > 0$
  4. Definition:  $x^T Ax > 0$  at all points except at  $x = 0$