1 hour exam
1 page of notes

definition, vocabulary
short answer
math. modelling : n, n_0, r
linear LS - I/O, O/O - longhand
I/O, O/O - matrix
max : 2x2 system of equations
non linear LS I/O, O/O
weights
error propagation $Y = AX + b$, $\Sigma_{xx} \to \Sigma_{yy}$

confidence intervals

Chapters $1, \underbrace{3, 4}_{\text{adjustment}}, \underbrace{5, 6, 8}_{\text{Prob}}$

Error Prop.
Post Adj. Stat

<u>HW2</u> - general comments for HW
Solution of LS problem

Summary of solution:
- method
- n, n_0, r
- parameters selected
- condition equations

<u>nonlinear problems</u>

1st iteration B, W, f $A f W$

show evidence of convergence

statement on convergence

Δ, X V: primary means for QA

$\hat{\ell}$

= global test

any other error prop

=

$$Av = f$$

$$\underline{Av} = d - \underline{A\ell}$$

$$z_i + v_i = a_0 + a_1 x + a_2 y + a_3 (x^2 + y^2)$$

$$v_i - a_0 - a_1 x - a_2 y - a_3 (x^2 + y^2) = -z_i$$

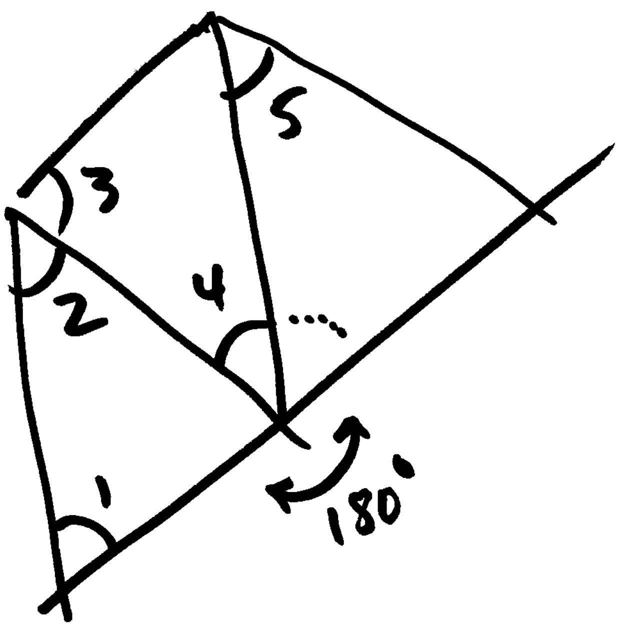
$$\begin{array}{ccccc} (v_i) & + & \begin{pmatrix} -1 & -x & -y & -(x^2+y^2) \end{pmatrix} & \begin{pmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \end{pmatrix} & = (-z_i) \\ v & + & B & \Delta & = f \end{array}$$

$$v = f - B\Delta$$

$$* \quad v = -(f - B\Delta)$$

$$w_i = \frac{\sigma_0^2}{\sigma_i^2} \neq \frac{\sigma_0}{\sigma_i}$$

$$= \left(\frac{\sigma_0}{\sigma_i}\right)^2$$



if $x \sim N(0, \Sigma)$ then

$x^T A x \sim \chi^2_r$ if $\underline{A\Sigma}$ is

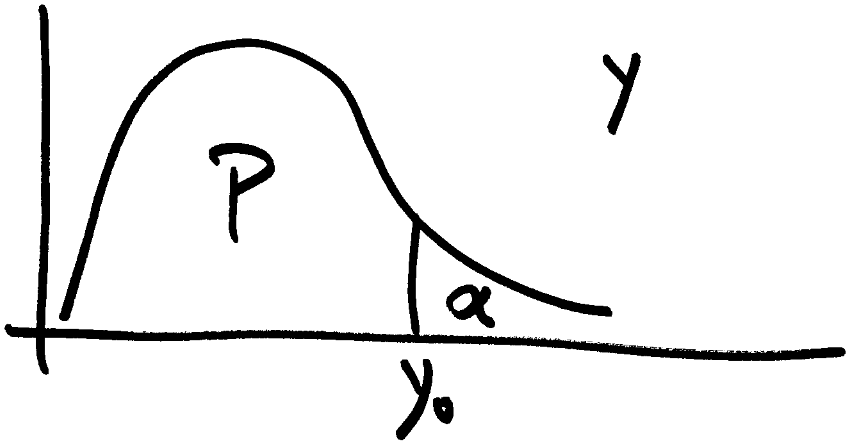
idempotent + rank r

$\uparrow$

$(A^2 = A)$

$$\boxed{\frac{v^T W v}{\sigma_0^2} \sim \chi^2_r}$$

$$y = (x - \mu_x)^T \Sigma^{-1} (x - \mu_x) \sim \chi^2_n$$



ask question: what region of X corresponds to area "P"?

$$P\left(y = (x-\mu_x)^T \Sigma^{-1} (x-\mu_x) < y_p\right) = 1-\alpha$$

$$R \Sigma R^T = D$$

D: diagonal eigenvalues of Σ

$$M = \underline{R \Sigma^{-1} R^T} = D^{-1}$$

$$D = \begin{pmatrix} d_1 & 0 \\ 0 & d_2 \end{pmatrix} \qquad X = \begin{pmatrix} x \\ y \end{pmatrix}$$

$$D^{-1} = M = \begin{pmatrix} 1/d_1 & 0 \\ 0 & 1/d_2 \end{pmatrix}$$

$R^T R$

insert this @ ↑

$$w = R(x - \mu)$$

$$P\left((x-\mu)^T \Sigma^{-1} (x-\mu) < \chi^2_{p,n} \right) = P$$

$$P\left(\underbrace{(x-\mu)^T R^T}_{w^T} \underbrace{R \Sigma^{-1} R^T}_{M} \underbrace{R(x-\mu)}_{w} < \chi^2_{p,n} \right) = P$$

$$P\left(w^T M w < \chi^2_{p,n} \right) = P$$

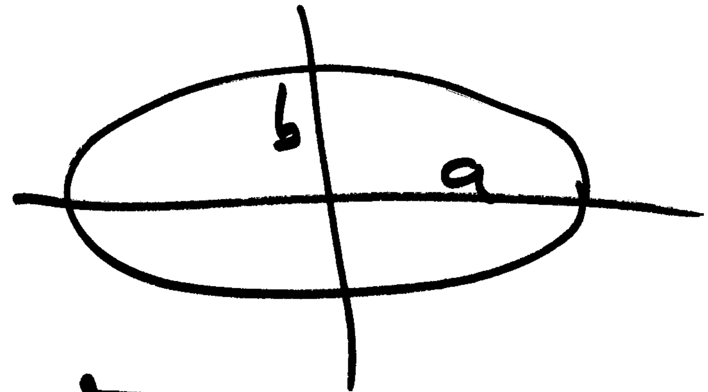
$$P\left((w_1 \; w_2) \begin{pmatrix} 1/d_1 & 0 \\ 0 & 1/d_2 \end{pmatrix} \begin{pmatrix} w_1 \\ w_2 \end{pmatrix} < \chi^2_{p,n} \right) = P$$

$$P\left(\frac{w_1^2}{d_1} + \frac{w_2^2}{d_2} < \underline{\chi^2_{p,n}} \right) = P$$

$$P\left(\frac{w_1^2}{d_1 \chi^2_{p,n}} + \frac{w_2^2}{d_2 \chi^2_{p,n}} < 1 \right) = P$$

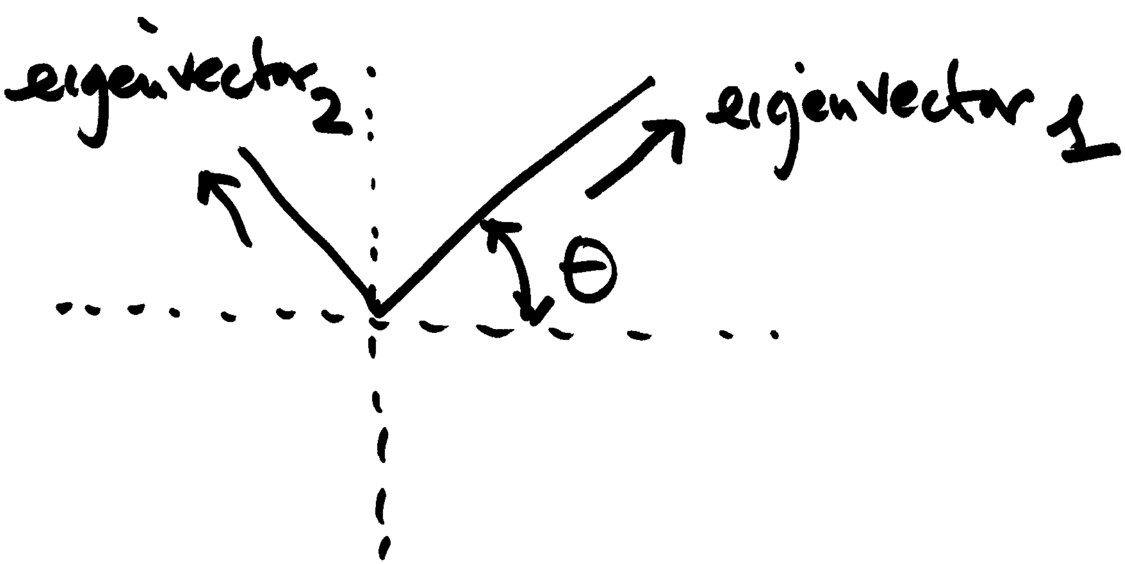
— this inequality represents interior of ellipse —

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$



semi major axis $= \sqrt{d_1 \, \chi^2_{p,n}}$

semi-minor axis : $\sqrt{d_2 \, \chi^2_{p,n}}$



$d_1 = \lambda_1$

$d_2 = \lambda_2$