6RA 6035 MATHEMATICS

Common mistakes: Final exam 11/2018

- not knowing the meaning of terms, especially:

  Null(A) = all solutions of $A \cdot \underline{x} = \underline{0}$

  dim Null(A) = # free variables in $A \cdot \underline{x} = \underline{0}$

- using RRC (reduced rank condition) without checking the assumptions:

  $\text{rk}\, A = 3$ and $D_1, D_2, D_3 > 0$ $\Rightarrow$ A is positive semi-definite

  (and $D_4 = 0$ follows from the assumptions)

- more generally, not giving reasons for conclusions and not referring to theory, especially:
  - * not saying why A is positive semidefinite (refer to RRC if it applies, or mention principal minors)
  - * not saying why equilibrium states are stable / unstable and especially globally asymptotically stable
  - * not referring to the envelope theorem correctly and not giving reasons why the slope of the tangent line of $f^*(a)$ has its value
  - * not writing arguments clearly enough (especially important to get an A)

- when showing that f has a global max in 36, to use the Hessian at the stationary point and not the Hessian at a general point, and to not argue well enough for the fact that $D_3 < 0$ at all points

- not understanding the notation $f^*(a)$, $x^*(a)$, etc and not writing the envelope theorem in a correct and meaningful way:

$$\frac{df^*(a)}{da} = f'_a\left(x^*(a), y^*(a), z^*(a)\right)$$

↑ derivative of $f^*(a)$, i.e. the slope of its target line at the given point, where $f^*(a)$ is maximum value function

↑ derivative of f, the fn. given in the problem, with respect to the parameter a, when we replace

$x \longmapsto x^*(a)$
$y \longmapsto y^*(a)$
$z \longmapsto z^*(a)$

To keep in mind for the retake exam:

- give reason for your answers, even when you think it should not be necessary
- show that there is a clear argument from the given information and theory in the course to the answer
- make sure you know the theory, especially definitions such as Null(A) - check lecture notes
- answer all questions
- use your time well on the exam, and make sure you have enough time for all 12 points

The comments above, about giving reason for answers, does not mean that you should write long answers — arguments are best when they are short and to the point