

## MATH REVIEW #4 SUPPLEMENT (MATH CAMP 2007)

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What follows is a rough sketch of material for Day 4.

### 1. DAY 4

#### (1) Multivariate Considerations

- (a) Homogeneous functions.
- (b) Partial derivative notations,  $dx$  and  $Df(x)$ .
- (c) Derivative as a linear operator

$$f(x) = \sum_{i=1}^N i \cdot x^i \quad f(x) = \sum_{i=1}^N e^{i\beta x}$$

#### (d) Partial derivatives

$$f(x, y) = x^\alpha y^\beta \quad f(x_1, \dots, x_N) = \left( \sum \alpha_i x_i^{\rho_i} \right)^{\frac{1}{\rho}}$$

- (e) Definition of derivative for  $\mathbb{R}^N \rightarrow \mathbb{R}$ ,
  - (i) How it looks.
  - (ii) "Hessian".
  - (iii) "Young's Theorem".
- (f) Hessian and Strict Concavity/Convexity.
- (g) Sufficient conditions for multivariate maxima.

#### (2) More Linear algebra

- (a) Dot product, vector "multiplication" and distance.
- (b) Solving  $Ax = b$ , inverses.
- (c) Eigenvectors/Eigenvalues and Definiteness.