

University of Rome TOR VERGATA - Master MESCI
Course: Mathematics for economics - Instructor: Paolo Paesani
Final exam - 21/12/2020

1. Linear systems (max. 5 points)

Solve the following linear system of equation applying two of the following three: 1) direct substitution, 2) matrix solution, 3) Cramer's rule

$$\begin{cases} 2x + 3y = 7 \\ 3x + y = 0 \end{cases}$$

2. Matrix algebra (max. 5 points): Based on the following square matrix

$$A = \begin{bmatrix} -3 & -4 \\ 5 & 2 \end{bmatrix}$$

Define and calculate: (a) matrix determinant; (b) transpose matrix; (c) scalar multiplication by 5; (d) matrix multiplication ($A*B$) where $B = \begin{bmatrix} 2 & 0 \\ 1 & -1 \end{bmatrix}$; (e) inverse matrix A^{-1}

3. Differential calculus (max. 8 points):

3.1 Based on the following function $y = \frac{2x^2+3}{x+6}$

Calculate: (a) first-order derivative $f'(x)$, (b) value of the slope of the function when $x = 1$

3.2 Based on the following function $y = 1/4(xt^4) + 3x^4w^{-1} - 5x^2tw^2$

Calculate: (a) partial derivative with respect to x , (b) partial derivative with respect to w , (c) partial derivative with respect to t .

4. Functional analysis (max. 12 points out of 30): Based on the following function

$$y = \frac{3x - 6}{2x + 6}$$

- a. Find the domain of the function
- b. Find the zeroes of the function;
- c. Find the limits and the asymptotes of the function (if any);
- d. Find the local minimums/maximums;
- e. Sketch the graph of the function.

BONUS QUESTION

B1. Functional analysis (max 5 points): Analyze the following function

$$y = x^2 - 10x + 16$$