

Business Mathematics (BK/IBA) – Quantitative Research Methods I (EBE)
Digital test 2 (sample)

Question 1

- a) Open the file “1234567_digitaltest_2_sample.docx” on the desktop.
- b) Type your name, student number, programme (BK/IBA/EBE), etc. at the appropriate places. **(1 point)**
- c) Save the document on the desktop under the filename in which “1234567” is replaced by your student number (=7 digits, not your VU-net ID!). Thus, the new filename becomes something like “8520981_digitaltest_2_sample.docx”.
- d) Leave the document open for inserting the answers to questions 2 and 3 in the indicated places. We recommend you to save your document regularly while doing the next questions.

Question 2

- a) Type a formula that expresses the following fact. The total duration of all matches in the premier league is the length of one match (90 minutes) times the number of matches. The number of matches is found from the fact that each of the clubs plays 2 times against all other clubs. Define symbols wherever you need. **(1 point)**
- b) Type a formula that corresponds to the following Excel syntax. **(1 point)**
“=(1-A1*B1)*ABS(B1/(A1+B1)^2)”

Question 3

- a) Use Excel’s matrix functions to solve the following system of linear equations:

$$\begin{cases} w - 4y + 2z = 5 \\ 3w + 2x - 6 = 0 \\ y - w = 2z \\ 2x + 3z = y - 5 + w \end{cases}$$

Make a screenshot¹ of the result. Take care to make the screenshot in such a way that all information (matrices/vectors, intermediate matrice/vectors) is visible, but no more. Paste it in the Word file. **(2 points)**

- b) Define a matrix $\mathbf{A} = \begin{pmatrix} -1.3 & 2.1 \\ 3.17 & -0.9 \\ -4.6 & 5.2 \end{pmatrix}$ and a matrix $\mathbf{B} = \begin{pmatrix} 3 & 0 & 2 \\ 0 & 4 & -2 \\ 1 & -2 & 6 \end{pmatrix}$. Use Excel’s matrix functions to calculate $\mathbf{AA}' + \mathbf{B} - 2\mathbf{I}$. Make a screenshot¹ of the result. Take care to make the screenshot in such a way that all information (matrices/vectors, intermediate matrice/vectors) is visible, but no more. Paste it in the Word file. **(2 points)**
- c) Use Excel’s Solver to solve the following problem:

¹ Use [alt][PrintScreen] to send a screenshot of the active window to the clipboard.

$$\begin{cases} \text{maximize} & f(x, y) = 5x^2 + 6xy - 12y - 8 \\ \text{subject to} & x + y \leq 120 \\ \text{and} & x \geq y \geq 2 \end{cases}$$

Make a screenshot¹ of the Solver's settings. Paste it in the Word file. **(2 points)**

d) Use Excel's Solver to solve the following problem:

$$\ln(x^2 + 4) = 5x^2 + 2x - 7$$

Check with a function plot if you have found all solutions. Report the value(s) returned by Excel in three decimals. **(1 point)**