

Business Mathematics (BK/IBA) – Quantitative Research Methods I (EBE)
Digital test retake 2 (25/04/2016 18:15-20:15)

Question 1

- a) Open the file “answers_digitaltest_retake2.docx” that is located on the D: drive.
- b) Type your name, student number, programme (IBA/BK/EBE), etc. at the appropriate places. **(2 points)**
- c) Save the document by using [ctrl][s]. Do not change filename and do not change file location.
- d) Leave the document open for inserting the answers to the remaining questions in the indicated places. We recommend you to save your document regularly while doing the next questions.

Question 2

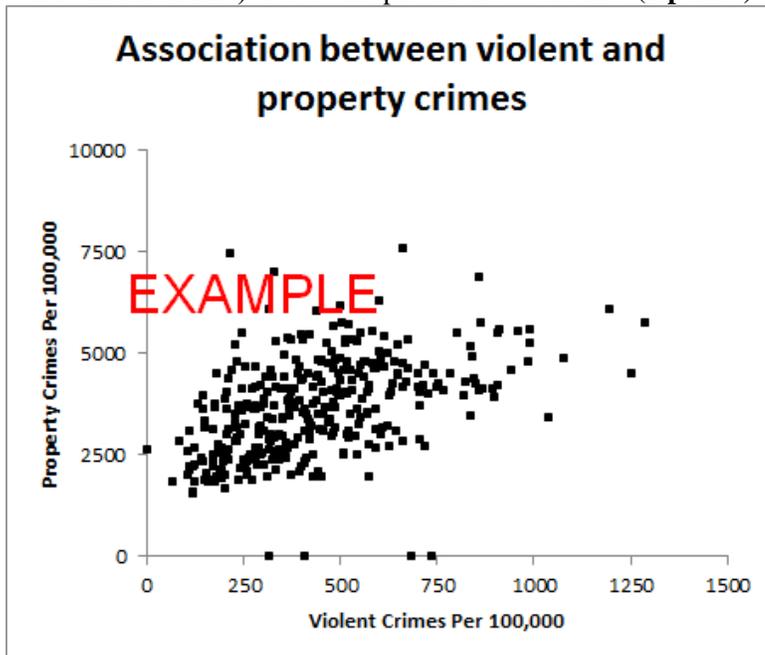
- a) Retype the following formula in a professionally typeset way into the document. You don't need to choose a font similar to the original one, but you should at least use the usual conventions for typing mathematical text, and type the mathematical part exactly as given (for instance, don't replace $\frac{1}{n}$ by $1/n$). **(2 points)**

$$\theta(x) = \begin{cases} \int_0^x \left(e^{\frac{1}{2\xi}} \right) d\xi & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

- b) Use the formula editor to type a mathematical formula that corresponds to the following Excel syntax. Use the usual conventions for typing mathematical text. **(1 point)**
“=MINVERSE(A1:D4)+(A7:D7*TRANSPOSE(A7:D7))”
- c) Given are the following facts: 1) a restaurant has a certain number of tables 2) each table has a certain number of places (it may differ per table). Give a formula for the total number of guests that can be seated in this restaurant. Introduce and explain symbols where needed, and apply the usual conventions for typing mathematical text. **(1 point)**

Question 3

- Open the file “excel_digitaltest_retake2.xlsx”. This file (from the book by Doane & Seward) contains data on the occurrence of different types of crime in 350 US cities. You don’t need to report anything. You don’t need to hand in your Excel file, but it is good practice to save it regularly.
- Create a new column (N) that represents a new variable derived from the existing data. The new column should for every city contain the share of robbery events in the total (violent+property) for that city. The formula should be such that you can easily copy it for all cities. Report the Excel formula used¹ for the first city by pasting it in the Word file. **(1 point)**
- Create another new column (O) that contains for every city the text “safe” if the violent crime rate is 100 or lower, and “unsafe” if it is higher. The formula should be such that you can easily copy it for all cities. Report the Excel formula used¹ for the first city by pasting it in the Word file. **(1 point)**
- Type a formula that counts how many cells in the column with Murder have a value of 5 or lower. Report the Excel formula used¹, and report the value. **(1 point)**
- Create a graph of the violent crime rate against the property crime rate for all 350 cities. Adjust the settings such that the graph looks as close as possible to the example below (but without the word “EXAMPLE”). Paste² the plot in the Word file. **(2 points)**



- The typical claim for a stolen car is \$20,000 but this varies per year. Type in cell P3 the value 20000. Type in cell P5 a formula that links to cells L5 and P3, such that you see the car theft damage per 100,000 in the first city. The formula should be done in a way so that it can easily be copied to other cities. Report the Excel formula used¹ for cell P5. **(1 point)**

¹ Excel formulas should be reported in plain Excel syntax, e.g., “=SQR(A1)”.

² Use Paste as picture to ensure that the result will not be changed if you change or delete the data.

Question 4

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

$$\begin{cases} p = q - r \\ p - q + 2r = 4 \\ 2p - 3q - 3 = s \\ q - 3s = -2 \end{cases}$$

Make a screenshot³ of the result. Take care to make the screenshot in such a way that all information (matrices/vectors, intermediate matrices/vectors) is visible, but no more. Paste it in the Word file. (2 points)

- b) Given is the function $f(x, y, z) = (x^2 + (y + 1)^2)e^{\sqrt{z}}$ and the constraint $x^2 + y^2 + z^2 \leq 5$. Use the solver⁴ to find the maximum. Make a screenshot³ of the settings of the Solver, and paste it in the Word file. Also state the formula¹ in the cell where f is calculated, and the value of f at the maximum point. (2 points)

- c) Make a graph of the function $h(x) = \frac{|\ln x|}{x}$ with domain $[0.5, 4.5]$ using steps of size $\Delta x = 0.01$. The plot may be a quick-and-dirty plot, but the scales of x and y should be such that the shape of h is clearly visible and the values of x and y should be visible besides the axes. Paste² the plot in the Word file. (2 points)

- d) Create in Excel a matrix $\mathbf{A} = \begin{pmatrix} 3 & 1 & 0 \\ -1 & 0 & 2 \\ 1 & 0 & -3 \end{pmatrix}$. Use Excel's functions to calculate $\mathbf{B} = \mathbf{A}\mathbf{A}'$, where \mathbf{A}' is the transpose of \mathbf{A} . Make a screenshot³ of the result. Take care to make the screenshot in such a way that all information (matrices/vectors, intermediate matrices/vectors) is visible, but no more. Paste it in the Word file. Report the formula¹ (or formulas, if you use intermediate steps) in the Word file. (2 points)

Ready?

Save your Word file, and **check location** (D: drive) and **name** (answers_digitaltest_retake2.docx).

Do not close Excel, and leave your Excel file open.

Next **start the icon "Tentamen inleveren"** on the desktop, log on with your VUnet ID and **upload your Word document**.

Make sure you have signed the attendance list.

³ Use [alt][PrintScreen] to send a screenshot of the active window to the clipboard.

⁴ Make sure the Solver add-in is active. If not, use Excel Options - Add-Ins to activate the Solver.