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OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG
FAKULTÄT FÜR MATHEMATIK

20177

Mathematics for Management (M.Sc.), written exam

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(1) Determine all eigenvalues and at least one eigenvector of the matrix

$$\begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 1 \end{pmatrix}. \qquad \textbf{(8 pt)}$$

(2) Compute the following limits:

(a) $\sqrt{n^2+3n}-n$, **(4 pt)**

(b) $(1-\frac{4}{n})^n$. **(4 pt)**

(3) The equation $yx = y^x$ defines a function $y(x)$ around the point $x = 2$ and $y = 2$. Determine $y'(2)$. **(8 pt)**

(4) Find the local extreme values of

$$f(x,y) = e^{-2x} + 2x + 2y^2 - 1 \qquad \textbf{(8 pt)}$$

and determine whether they are maxima or minima.

(5) Determine the following integrals:

(a) $\int \frac{2x+4}{x^2+4x+5}\,dx$ **(5 pt)**

(b) $\int z^a \ln(z)\,dz$, $a \neq -1$ **(5 pt)**

(6) Show that the function

$$f(x,y) = 2x^3 - 18xy + 9y^2 \qquad \textbf{(8 pt)}$$

has a local minimum for $x_0 = 3$, $y_0 = 3$.