

MATHEMATICS

Tuesday March 21 2017

Sixth exercise class

- 1) For each of the following matrices, determine its eigenvalues and the related eigenvectors. Determine the algebraic multiplicity and the geometric multiplicities of each eigenvalues. Decide if it is possible to diagonalize the matrix. In positive case, find a change of basis matrix that diagonalizes it.

$$A = \begin{pmatrix} 2 & 0 & 0 \\ -1 & 3 & 3 \\ 6 & -6 & -6 \end{pmatrix},$$

$$B = \begin{pmatrix} 4 & 1 & 6 \\ 0 & 2 & 3 \\ 0 & 0 & 7 \end{pmatrix},$$

$$C = \begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix},$$

$$D = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & -1 \\ 0 & 2 & 4 \end{pmatrix},$$

$$E = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}.$$

- 2) Determine, when changing k, eigenvalues, eigenvectors and diagonalizability of the following matrix.

$$A = \begin{pmatrix} 0 & k \\ 2 & k - 2 \end{pmatrix}$$

- 3) Calculate the following indefinite integrals.

a)

$$\int \frac{(x+2)(x-3)}{x} dx$$

b)

$$\int \frac{x^2 - 1}{x - 3} dx$$

c)

$$\int \frac{x}{1+x} dx$$

d)

$$\int \sqrt[3]{(x+1)^2} dx$$

e)

$$\int e^{\cos(x)} \sin(x) dx$$

f)

$$\int \frac{\sqrt{\log(x)}}{x} dx$$

g)

$$\int x^5 \sin(x^6) dx$$

h)

$$\int \frac{1}{4+9x^2} dx$$

i)

$$\int x e^x dx$$

j)

$$\int \log(x) dx$$

k)

$$\int \operatorname{atan}(x) dx$$

l)

$$\int e^x \cos(x) dx$$