MA1201 Linear Algebra and Geometry

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Sciences

Exercise set 01

Glossary

Engelsk	Norsk
matrix	matrise
augmented matrix	utvided matrise
row echolon form	trappeform
reduced row echolon form	redusert trappeform
pivot	ledende ener (pivot)

Compulsory exercises

Hand in your solutions to these exercises. All answers must be justified.

Chapter 1.1 - Systems of linear equations

Exercise 1 Exercise 1 and 2 in chapter 1.1 of Elementary Linear Algebra

The linear equations are 1a, 1c, 1f, 2a, 2c, and 2f. All the other equations are non-linear, since they involve multiplying together indeterminants, raising indeterminants to powers, or applying trigonometric functions to indeterminants.

Exercise 2 Exercise 5b in chapter 1.1 of Elementary Linear Algebra

The corresponding system is

$$3x_1 - 2x_3 = 5$$
$$7x_1 + x_2 + 4x_3 = -3$$
$$-2x_2 + x_3 = 7$$

Exercise 3 Exercise 8a in chapter 1.1 of Elementary Linear Algebra

The corresponding augmented matrix is

$$\begin{pmatrix} 3 & -2 & -1 \\ 4 & 5 & 3 \\ 7 & 3 & 2 \end{pmatrix}$$

Exercise 4 Exercise 9d in chapter 1.1 of Elementary Linear Algebra

The tuple is indeed a solution, because

$$2 \cdot \frac{13}{2} - 4 \cdot \frac{5}{2} - 2 = 1$$
$$\frac{13}{2} - 3 \cdot \frac{5}{2} + 2 = 1$$
$$3 \cdot \frac{13}{2} - 5 \cdot \frac{5}{2} - 3 \cdot 2 = 1$$

Chapter 1.2 - Gaussian elimination

Exercise 5 Exercise 8 in chapter 1.2 of Elementary Linear Algebra

We set up the augmented matrix

$$\begin{pmatrix} 0 & -2 & 3 & 1 \\ 3 & 6 & -3 & -2 \\ 6 & 6 & 3 & 5 \end{pmatrix}$$

We row reduce:

$$\begin{pmatrix} 0 & -2 & 3 & 1 \\ 3 & 6 & -3 & -2 \\ 6 & 6 & 3 & 5 \end{pmatrix} \sim \begin{pmatrix} 3 & 6 & -3 & -2 \\ 0 & -2 & 3 & 1 \\ 6 & 6 & 3 & 5 \end{pmatrix} \sim \begin{pmatrix} 3 & 6 & -3 & -2 \\ 0 & -2 & 3 & 1 \\ 0 & -6 & 9 & 9 \end{pmatrix} \sim \begin{pmatrix} 3 & 6 & -3 & -2 \\ 0 & -2 & 3 & 1 \\ 0 & 0 & 0 & 6 \end{pmatrix}$$

At this point we notice that the last row corresponds to the equation $0 = 6$, which has no solutions. Thus the system has no solutions.