

## Matrix algebra – addition and multiplication

### Exercise 2.6

Determine for what values of  $u$  and  $v$  the following equality holds:

$$\begin{pmatrix} (1-u)^2 & v^2 & 3 \\ v & 2u & 5 \\ 6 & u & -1 \end{pmatrix} = \begin{pmatrix} 4 & 4 & u \\ v & -3v & u-v \\ 6 & v+5 & -1 \end{pmatrix}$$

### Exercise 2.7

Evaluate  $A + B$ ,  $A - B$  and  $5A - 3B$  when

$$A = \begin{pmatrix} 0 & 1 & -1 \\ 2 & 3 & 7 \end{pmatrix} \text{ and } B = \begin{pmatrix} 1 & -1 & 5 \\ 0 & 1 & 9 \end{pmatrix}$$

### Exercise 2.8

- If  $x + 0 = 0$ , what do you know about the components of  $x$ ?
- If  $0x = 0$ , what do you know about the components of  $x$ ?
- Solve the vector equation  $4x - 7a = 2x + 8b - a$  for  $x$  in terms of vectors  $a$  and  $b$ .

### Exercise 2.9

Compute the products  $AB$  and  $BA$ , if possible, when  $A$  and  $B$  are, respectively

a.  $A = \begin{pmatrix} 0 & -2 \\ 3 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} -1 & 4 \\ 1 & 5 \end{pmatrix}$

b.  $A = \begin{pmatrix} 8 & 3 & -2 \\ 1 & 0 & 4 \end{pmatrix}$  and  $B = \begin{pmatrix} 2 & -2 \\ 4 & 3 \\ 1 & -5 \end{pmatrix}$

c.  $A = \begin{pmatrix} -1 & 0 \\ 2 & 4 \end{pmatrix}$  and  $B = \begin{pmatrix} 3 & 1 \\ -1 & 1 \\ 0 & 2 \end{pmatrix}$

d.  $A = \begin{pmatrix} 0 \\ -2 \\ 4 \end{pmatrix}$  and  $B = (0 \ -2 \ 3)$

### Exercise 2.10

Show that  $A(BC) = (AB)C$  with:

$$A = \begin{pmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{pmatrix}, B = \begin{pmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{pmatrix}, C = \begin{pmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{pmatrix},$$

**Exercise 2.12**

Find all matrices  $B$  that commute with:

$$A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$$

in the sense that  $AB = BA$