Graphics 2
Matrix and vector operations
Non-assessed exercise

This exercise is to develop practical skills in matrix and vector operations (see handout *Mathematical Tools for Computer Graphics*).

The solutions will be available on 17th January at:
http://www.cs.bham.ac.uk/~exc/Teaching/Graphics/

Matrix operations
Let:

$$A = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 0 & -2 \\ 4 & 5 \end{bmatrix} \quad C = \begin{bmatrix} 4 & 1 & 0 \\ 1 & 3 & 2 \\ 0 & 2 & 5 \end{bmatrix} \quad D = \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix} \quad E = \begin{bmatrix} 9 & 0 & 5 \end{bmatrix}$$

Calculate the following expressions or give reasons why the are undefined:

1. A + B
2. B + A
3. C + D
4. C + E
5. 3E
6. 2A + B
7. A * B
8. B * A
9. A * D
10. C * D
11. D * C
12. E * C
13. D * E
14. E * D

Vector operations
Let:

$\bar{a} = [\ 1 \quad 1 \quad 0\ ]$ $\bar{b} = [\ -1 \quad 2 \quad 0\ ]$ $\bar{c} = [\ 2 \quad 3 \quad 1\ ]$ $\bar{d} = [\ 5 \quad -7 \quad 2\ ]$ $\bar{e} = [\ 7 \quad -7 \quad 1\ ]$

Calculate the following expressions:

15. $3 \cdot \bar{a}$
16. $-2 \cdot \bar{c}$
17. $\bar{a} + \bar{b}$
18. $\bar{c} - \bar{d}$
19. $\bar{a} \cdot \bar{b}$
20. $\bar{b} \cdot \bar{a}$
21. $\bar{c} \cdot \bar{d}$
22. $\bar{a} \times \bar{b}$
23. $\bar{b} \times \bar{a}$
24. $\bar{a} \times \bar{c} + \bar{c} \times \bar{a}$
25. $\bar{a} \times \bar{e}$