Universität Duisburg-Essen   Fall Term 2010/11
Computational Mechanics
Campus Essen

Dr. S. Vanis   16. December 2010

Introduction to Numerical Methods
Tutorial 10

Exercise 1:
Use the modified Gram-Schmidt orthogonalization algorithm to find three normalized orthogonal vectors spanning the same space as

$$a_1 = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} \quad , \quad a_2 = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix} \quad , \quad a_3 = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix} \quad .$$

Exercise 2:
Solve the systems from Exercise 1 in Tutorial 9 manually using the QR-decomposition.

(*)-Exercise 3: (8 points)
Show that in exact arithmetic the Gram-Schmidt and the modified Gram-Schmidt orthogonalization are equivalent, i.e., show that they lead to the same results in exact arithmetic.

Programming-Exercise 3: (delivery date: 13. January 2010, 10 points)
Program a QR-decomposition to solve linear systems which are not quadratic using

$$Rx = Q^T b.$$

Test your algorithm on the examples given in exercise 2.

Delivery: 23. December 2010

Voluntary task:
To be able to improve my teaching I would like you to give me a short feedback what you think is good and what you would like me to modify.
You can hand in a feedback but you don't have to.
Furthermore you can hand it in anonymously, e.g., by writing it on the computer.

Thanking you in anticipation
Dr. Stefanie Vanis