

ASEN 5107 Nonlinear Finite Element Methods - Spring 2007

Homework 9: Newton and Newton Like Methods

Due Thursday April 5, 2007, after Spring Break

Be sure to attach this sheet as cover to your HW

Four exercises:

20.3 (computer, 25 pts)

21.1 (this is a one-liner, 10 pts)

21.2 (this takes a bit more algebra, 20 pts)

21.3 (similar to 21.2, 20 pts)

Notes on Exercise 20.3. A Notebook containing a Newton implementation for Load Control (LC) can be downloaded from Chapter 20 Index. The purpose of 20.3 is to code Newton for Arclength Control (AC). Since the Newton system for AC is tiny (3 equations) there is no need to complicate the code by using the auxiliary system (two right-hand-sides) technique. Just feed the augmented Newton system to `Inverse` or `LinearSolve`.

Notes on Exercises 21.1-21.3. These are entwined with the relaxation equations. The basic idea (of viewing corrective methods as pseudodynamical systems) is important in dealing with contact and material nonlinearities. Although the formulation of these nonlinearities is not treated in this course, the approach may come in handy if you have to deal with such problems in the future.

Chapter 21 is new, a condensation from several research papers.

Chapter 22 will not be covered. In preparation to complete Chapter 21 with research material.

Chapter 23 will be posted but only one technique will be mentioned in class. The topic of detecting and traversing bifurcation points for stability analysis is huge and some specialists (especially in Chemical Engineering) spend their life working on parts of it.

Second Midterm Exam

The midterm exam will cover Solution Methods (Chapters 16 onwards). Because the posed problem require programming, it will be given as a take home, assigned on Thursday April 5, due on Thursday April 12. The class of April 10 may be used for discussing the exam progress.