

ASEN 5107 Nonlinear Finite Element Methods - Spring 2006
Homework 3: Critical Points and Conservative Systems (Chapters 5-6 of Notes)

Due Thursday February 8, 2007

Be sure to attach this sheet as cover to your HW

Exercises:

5.1: items (a),(b),(c) but omit (d)

6.3 (long but instructive)

6.4

Grading weights: given at the start of the Exercises.

Partial results for Ex. 6.3 as regards determination of limit points.

(c) exact: $\partial\lambda/\partial\mu = (\partial\lambda/\partial\theta)(\partial\theta/\partial\mu) = 0$ leads to $\cos^3 \theta_L = \cos \alpha$, from which $\theta_{L1} = 17.60120^\circ$, $\mu_{L1} = 0.45052093$, $\lambda_{L1} = +0.0638560$, $\theta_{L2} = -\theta_{L1}$, etc.

(d) cubic approximation: $3\theta_L^2 = \alpha^2$ giving $\theta_{L1} = 17.32051^\circ$, $\mu_{L1} = 0.4226495$, $\lambda_{L1} = +0.0552515$, etc.

Partial result for Ex. 6.4:

$$\kappa = \frac{1}{2} \left(3 \frac{\theta^2}{\alpha^2} - 1 \right) = \frac{1}{2} (3(1 - \mu)^2 - 1)$$