Assignment for "Bifurcation, Catastrophe, Singularity, and All That"

John Burkardt

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http://people.sc.fsu.edu/~jburkardt/latex/bifurcation/bifurcation_assignment.pdf
http://people.sc.fsu.edu/~jburkardt/m_src/test_con/test_con.html

1.) *The Buckling Spring*: Define $\mathbf{M} = 101$ equally spaced values

$$0.25 <= L_i <= 1.75$$

and $\mathbf{N} = 101$ equally spaced values

$$\frac{-3\pi}{8} <= \theta_j <= \frac{+3\pi}{8}$$

Then define $\mathbf{M}$ by $\mathbf{N}$ arrays $\lambda_{i,j}$ and $\mu_{i,j}$ by evaluating the formulas that relate λ and μ to $\mathbf{L}$ and θ.

Use the MATLAB **plot** command on the pair of arrays, to create an image of the structure of the solutions of the buckling spring. Use the MATLAB **axis** command to restrict the plot to $0.1 \leq \lambda \leq 0.9$ and $-0.07 \leq \mu \leq +0.07$.

Turn in 1 plot.

2.) *The Freudenstein Roth Function*: Use the code **p01_target_test.m**, First use the starting point (4,3,0), and compute a series of solutions until you reach the target value (?.?,1). Modify the code to save each computed point in an array so that at the end, you can use the MATLAB command **scatter3** to plot the 3D set of points.

Repeat the exercise, but use the starting point (15,-2,0). Again, use the MATLAB command **scatter3** to plot the 3D points.

Turn in 2 plots.

3.) *The Aircraft Model*: Use the code **p06_limit_test.m**, and do a limit point search, using each of the following values of X6 (**elevator setting**): -0.050, -0.008, 0.000, +0.050, and 0.100. A paper by Melhem and Rheinboldt observed 1, 3, 2, 1, and 1 limit points respectively. Save the points calculated. For each run, make a plot of the values of X1 (**roll rate**) versus X7 (**aileron**). You might notice one extra limit point when you repeat their calculations.

Turn in 5 plots.