ADAPTIVEDYNAMICS
Exercise 10-11

Exercise 12
This is a continuation of exercise 11 where we practiced to numerically calculate isoclines for the evolution of a dimorphic population. We now practice to numerically calculate solutions of the canonical equation (CE) and orbits of the stochastic differential equation (SDE) as approximations of substitution sequences.

Consider the Lotka-Volterra competition model with $K(x) = e^{-(x-\delta)^4} + e^{-(x+\delta)^2}$ and $a(x,y) = e^{-\alpha(x-y)^2 - \beta(x-y)}$ with $\alpha = 2.0$, $\beta = -0.4$ and $\delta = 1.0$.

(a) Calculate numerically solutions of the canonical equation (CE) for a monomorphic resident population using the Euler integration method. Try different starting points.

(b) Calculate numerically solutions of the stochastic differential equation (SDE) in a monomorphic resident population using the Euler integration method. Try different starting points. For each starting point try different runs.

(c) Calculate numerically solutions of the canonical equation (CE) for a dimorphic resident population using the Euler integration method. As starting point, start inside the region of coexistence and near a branching point.

(d) Calculate numerically solutions of the stochastic differential equation (SDE) in a monomorphic resident population using the Euler integration method. As starting point, start inside the region of coexistence and near a branching point. Make several runs for the same starting point.

Exercise 13
In the same model as above, which of the singular points in the dimorphic resident population are *totally* stable, which are *strongly* stable and which are *weakly* stable. What do these different kinds of stability refer to?

N.B. after you have done the above exercises, feel free to vary the parameters.