**Bifurcations**

Consider the differential equation

\[
\frac{dy}{dt} = ay - y^2
\]

where \(a\) is a constant parameter.

1. Determine the two equilibrium points (call these \(y_{e1}\) and \(y_{e2}\)).

2. Using the derivative test,
   - Person 1: Determine the stability of \(y_{e1}\).
   - Person 2: Determine the stability of \(y_{e2}\).

3. Draw the bifurcation diagram (Person 1 draw the curve that corresponds to \(y_{e1}\), Person 2 draw the curve that correspond to \(y_{e2}\)).

4. Determine the bifurcation point (call this \(a_{bf}\)) and explain why a bifurcation occurs at this point.
5. Using the bifurcation diagram from #3, draw the phase lines and sketch corresponding solutions.

Person 1: Do this for $a < a_{bif}$
Person 2: Do this for $a > a_{bif}$
Team: Do this for $a = a_{bif}$