1: Classify the fixed points of the following systems of equations and state the type of stability for each one.

1a:
\[
\begin{align*}
\frac{dx}{dt} &= 2x - 3y \\
\frac{dy}{dt} &= \alpha y - 2x
\end{align*}
\]

1b:
\[
\begin{align*}
\frac{dx}{dt} &= y^2 - 3x + 2 \\
\frac{dy}{dt} &= x^2 - y^2
\end{align*}
\]

1c:
\[
\begin{align*}
\frac{dx}{dt} &= -y + x + xy \\
\frac{dy}{dt} &= x - y - y^2
\end{align*}
\]

2: Show that the following differential equation exhibits a pitchfork bifurcation. Draw both cases of the bifurcation diagram

\[
\frac{dx}{dt} = ax - bx^3
\]

3: Draw the complete phase portrait diagram for the following system of equations. Verify all the fixed points and their stability.

\[
\begin{align*}
\frac{dx}{dt} &= x(x - 2) \\
\frac{dy}{dt} &= y(-2x - y + 6)
\end{align*}
\]