6. [12 points] Consider the nonlinear system

\[
\begin{align*}
x' &= 3x - y - x^2, \\
y' &= -\alpha + x - y,
\end{align*}
\]

where \( \alpha \) is a real-valued parameter.

a. [4 points] Find all critical points for the system, and show that for \( \alpha > -1 \) there are two critical points, if \( \alpha = -1 \) there is one, and if \( \alpha < -1 \) there are none.

b. [8 points] Let \( \alpha = 0 \): then the system has two critical points, \((0,0)\) and \((2,2)\). Sketch a phase portrait for the nonlinear system by linearizing at critical points and determining the resulting behavior in the phase plane.