(1) Find and classify the equilibrium points (as sinks, sources, saddles or non-hyperbolic) for \( x' = f(x) \) with \( f \) given as follows:

(a) \( f(x, y) = (x - xy, y - x^2) \).
(b) \( f(x, y) = (-4y + 2xy - 8, 4y^2 - x^3) \).
(c) \( f(x, y) = (2x - 2xy, 2y - x^2 + y^2) \).
(d) \( f(x, y, z) = (-x, -y + x^2, z + x^2) \).

(2) Classify the equilibrium points of the so called Lorenz equation \( x' = f(x) \) with

\[
\begin{bmatrix}
    x_2 - x_1 \\
    \mu x_1 - x_2 - x_1 x_3 \\
    x_1 x_2 - x_3
\end{bmatrix}
\]

for a given \( \mu > 0 \). (Note that the number of equilibrium points depends on \( \mu \)).

(3) Consider the differential equation

\[
x' = \begin{bmatrix}
    -x_1 \\
    x_2 + x_1^2
\end{bmatrix}.
\]

(a) Determine the flow and find the stable and the unstable set.
(b) Calculate the first three successive approximations for the stable set near the origin.

(4) Consider the differential equation

\[
x' = \begin{bmatrix}
    -x_1 \\
    -x_2 + x_1^2 \\
    x_3 + x_2^2
\end{bmatrix}.
\]
(a) Determine the flow and find the stable and the unstable set.
(b) Calculate the first four successive approximations for the stable set and the unstable set near the origin.