Extra HW for Chap. 9

Questions: For the following equations:

1.
$$x' = 14x - 2x^2 - xy \quad y' = 16y - 2y^2 - xy$$

2.
$$x' = -x + \sin y \quad y' = 2y$$

3.
$$x' = x(3 - y) \quad y' = y(-2 + x)$$

4.
$$x'' + 9x - x^3 = 0$$

    a Determine all the critical points.

    b Find the linear equation for those critical points.

    c Determine nonlinear stability properties of the equations in the neighborhood of these critical points.

    d Sketch phase portraits in the neighborhood of these critical points.