1.

$$\dot{q} = f(q,p)$$

$$\dot{p} = g(q,p) \qquad f(q_0, p_0) = 1$$

$$x' = 2x - y$$
$$y' = x + 2y$$

b)

$$M = \begin{pmatrix} \frac{\partial x'}{\partial x} & \frac{\partial x'}{\partial y} \\ \frac{\partial y'}{\partial x} & \frac{\partial y'}{\partial y} \end{pmatrix} = \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$$

c)

$$\det\left|\begin{pmatrix} 2-\lambda & -1 \\ 1 & 2-\lambda \end{pmatrix}\right| = 4 - 4\lambda + \lambda^2 + 1 = 0$$

$$= \lambda^2 - 4\lambda + 5 = 0$$

$$(\lambda - 2 + i)(\lambda - 2 - i) = 0$$

$$\lambda_1 = 2 - i$$
$$\lambda_2 = 2 + i$$