(4) demostrar que $J = \frac{\partial x_{n+1}}{\partial x_n} \frac{\partial v_{n+1}}{\partial v_n} - \frac{\partial x_{n+1}}{\partial v_n} \frac{\partial v_{n+1}}{\partial x_n} = 1$

conociendo que Verlet es:

$x_{n+1} = x_n + v_n h + \frac{1}{2} a_n (h)^2$.

$v_{n+1} = v_n + \frac{1}{2}(a_n + a_{n+1}) h$

entonces:

$$\frac{\partial x_{n+1}}{\partial x_n} = 1 \quad \frac{\partial x_{n+1}}{\partial v_n} = h$$

$$\frac{\partial v_{n+1}}{\partial x_n} = 0 \quad \frac{\partial v_{n+1}}{\partial v_n} = 1$$

$$J = \begin{pmatrix} \frac{\partial x_{n+1}}{\partial x_n} & \frac{\partial x_{n+1}}{\partial v_n} \\ \frac{\partial v_{n+1}}{\partial x_n} & \frac{\partial v_{n+1}}{\partial v_n} \end{pmatrix} = \begin{pmatrix} 1 & h \\ 0 & 1 \end{pmatrix} = \text{Determinante} = \underline{1}$$