L 4) $H(q,p) = \frac{p^2}{2(1+a\sin q)} - \cos q.$

$$\dot{q} = \frac{\partial H}{\partial p} = \frac{\partial}{\partial p}\left(\frac{p^2}{2(1+a\sin q)} - \cos q\right)$$

$$= \frac{p}{(1+a\sin q)}$$

$$\frac{\partial^2 H}{\partial p^2} = \frac{\partial}{\partial p}\left(\frac{p}{(1+a\sin q)}\right) = \frac{1}{1+a\sin q}.$$

$$\dot{p} = -\frac{\partial H}{\partial q} = -\frac{\partial}{\partial q}\left(\frac{p^2}{2(1+a\sin q)} - \cos q\right)$$ ✓

$$= \frac{+a p^2 \cos q}{2(1+a\sin q)^2} - \sin q.$$

$$-\frac{\partial^2 H}{\partial q^2} = \frac{\partial}{\partial q}\left(\frac{+a p^2\cos q}{2(1+a\sin q)^2} - \sin q\right)$$

$$= \frac{\left(2(1+a\sin q)^2 \frac{\partial}{\partial q}(+ap^2\cos q) - (+ap^2\cos q)\frac{\partial}{\partial q}\left(2(1+a\sin q)^2\right)\right)}{4(1+a\sin q)^4}$$ ✓

$$- \cos q$$

$$= \frac{-2(1+a\sin q)^2 a p^2 \sin q - 4a^2p^2\cos^2 q(1+a\sin q)}{4(1+a\sin q)^4}$$

$$- \cos q$$

$$= \frac{(1+a\sin q)ap^2\sin q - 2a^2p^2\cos^2 q}{2(1+a\sin q)^3} + \cos q.$$

$$= \frac{ap^2\sin q - a^2p^2\cos^2 q - a^2p^2}{2(1+a\sin q)^3} + \cos q.$$

$$\frac{\partial^2 H}{\partial q \partial p} = \frac{\partial}{\partial q}\left(\frac{\partial H}{\partial p}\right) = \frac{\partial}{\partial q}\left(\frac{p}{(1+a\sin q)}\right)$$

$$= \frac{-ap\cos q}{(1+a\sin q)^2}$$

At the fixed points, $\dot{p} = \dot{q} = 0$