8-31 The condition for stability is 8.93

$$\frac{F'(\rho)}{F(\rho)} + \frac{3}{\rho} > 0 \quad \text{with } F(\rho) = -\frac{k}{\rho^2} - \frac{k'}{\rho^4}$$

$$\frac{F'(\rho)}{F(\rho)} + \frac{3}{\rho} = \frac{\frac{2k}{\rho^3} + \frac{4k'}{\rho^5}}{-\frac{k}{\rho^2} - \frac{k'}{\rho^4}} + \frac{3}{\rho}$$

$$= -\frac{2k\rho^2 + 4k'}{k\rho^3 + k'\rho} + \frac{3}{\rho}$$

$$= \frac{-2k\rho^3 - 4k'\rho + 3k\rho^3 + 3k'\rho}{\rho(k\rho^3 + k'\rho)}$$

$$= \frac{k\rho^3 - k'\rho}{\rho(k\rho^3 + k'\rho)} = \frac{1}{\rho}\frac{(k\rho^2 - k')}{(k\rho^2 + k')}$$

The denominator is positive definite so the condition for this quantity to be positive is

$$k\rho^2 - k' > 0 \Rightarrow k\rho^2 > k'$$

Note that it was not necessary to calculate ρ.