$$x = \sqrt{\frac{2J}{m\omega}} \cos\theta$$

$$p = \sqrt{2m\omega J} \sin\theta$$

$$x^2 + p^2 =$$

$$\frac{2J}{m\omega} \cos^2\theta + 2m\omega J \sin^2\theta$$

$$\frac{p^2}{2m} = J\omega \sin^2\theta$$

$$\frac{m\omega^2}{2} x^2 = J\omega \cos^2\theta$$

$$\rightarrow H = \omega J$$

$$x^2 = \frac{2J}{m\omega} \cos^2\theta$$

$$\frac{x^2 m\omega}{2J} = \cos^2\theta$$

$$\rightarrow \frac{x^2 m\omega^2}{2H} = \cos^2\theta \rightarrow \frac{x^2 m\omega^2}{\frac{p^2}{m} + m\omega^2 x^2} = \cos^2\theta$$

$$= \frac{x^2 m^2\omega^2}{p^2 + m^2\omega^2 x^2} = \cos^2\theta$$

$$= \frac{1}{1 + \frac{p^2}{m^2\omega^2 x^2}} = \cos^2\theta$$

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besser:

$$\frac{p}{x} = \frac{\sqrt{2m\omega J} \sin\theta}{\sqrt{\frac{2J}{m\omega}} \cos\theta} = m\omega \tan\theta$$

Zeige, dass Trafo kanonisch ist und wir Hamilton-BWGL verwenden dürfen. Beziehung muss erfüllt sein:

$$\{Q_i, P_j\}_{q,p} = \delta_{ij}$$

$$\{f, g\}_{q,p} = \sum_{i=1}^{N} \left(\frac{\partial f}{\partial q_i} \frac{\partial g}{\partial p_i} - \frac{\partial f}{\partial p_i} \frac{\partial g}{\partial q_i} \right)$$

$$= \left(\frac{\partial J}{\partial x} \frac{\partial \theta}{\partial p} - \frac{\partial J}{\partial p} \frac{\partial \theta}{\partial x} \right)$$

$$\theta = \arctan\left(\frac{p}{m\omega x} \right)$$