1.1 $\epsilon_z = \sqrt{\langle x^2\rangle\langle x'^2\rangle - \langle xx'\rangle^2}$ $\qquad x'' + Kx = 0 \Rightarrow x'' = -Kx$

$$\frac{d}{dx}[u^n] = n[u]^{n-1} \cdot u'$$

$1/2\epsilon_z$

$$\frac{d\epsilon_z}{dz} = \frac{1}{2}\left(\langle x^2\rangle\langle x'^2\rangle - \langle xx'\rangle^2\right)^{-1/2} \cdot \frac{d}{dz}\left(\langle x^2\rangle\langle x'^2\rangle - \langle xx'\rangle^2\right)$$

$$= \frac{1}{2\epsilon_z}\left(\frac{d}{dz}\left[\langle x^2\rangle\langle x'^2\rangle\right] - \frac{d}{dz}\langle xx'\rangle^2\right)$$

$$= \frac{1}{2\epsilon_z}\left(\left(\frac{d}{dz}\langle x^2\rangle\right)\langle x'^2\rangle + \langle x^2\rangle\frac{d}{dz}\langle x'^2\rangle - \frac{d}{dz}\langle xx'\rangle^2\right)$$

$$= \frac{1}{2\epsilon_z}\left(\langle 2xx'\rangle\langle x'^2\rangle + \langle x^2\rangle\langle 2x'x''\rangle - 2\langle xx'\rangle\left\langle\frac{d}{dz}(xx')\right\rangle\right)$$

$$= \frac{1}{2\epsilon_z}\left(\langle 2xx'\rangle\langle x'^2\rangle + (-K)\langle x^2\rangle\langle 2x'x\rangle - 2\langle xx'\rangle\left\langle\frac{d}{dz}(xx')\right\rangle\right)$$

$$= \frac{1}{2\epsilon_z}\langle 2xx'\rangle\left(\langle x'^2\rangle - K\langle x^2\rangle - \langle x'^2 + xx''\rangle\right)$$

$$= \frac{1}{2\epsilon_z}\langle 2xx'\rangle\left(\langle x'^2\rangle - K\langle x^2\rangle - \langle x'^2 - Kx^2\rangle\right)$$

$$\boxed{\frac{d\epsilon_z}{dz} = 0}$$