$$\sigma \quad = \quad \sqrt{\frac{\sum_{i=0}^{N} \left(v_i - \bar{v}\right)^2}{N}}$$

$$(\text{luminosity})^A \, (\text{size})^B \, (\text{velocity dispersion})^C \quad = \quad \text{constant}$$

$$2 * (\text{kinetic energy}) + (\text{potential energy}) \quad = \quad 0$$

$$2K + U \quad = \quad 0$$

$$K \quad = \quad -\frac{1}{2}U$$

$$U \quad = \quad -\frac{GMm}{R}$$

$$K \quad = \quad \frac{1}{2}mv^2$$

$$v^2 \quad = \quad \frac{GM}{R}$$

$$\text{if} \quad M \propto L \qquad \rightarrow \quad v^2 \quad \propto \quad L$$

$$v^2 R \quad = \quad 2GM$$

$$\sigma^2 \quad = \quad K\,(\frac{M}{R})$$

$$\sigma^2 \quad \propto \quad \frac{L}{R}$$

$$L \quad = \quad \mu\,(\pi R^2) \quad \rightarrow \quad R \quad \propto \quad L^{1/2}$$

$$L \quad \propto \quad \sigma^4$$

$$(\text{luminosity})^A \quad = \quad \frac{\text{constant}}{(\text{size})^B \, (\text{velocity dispersion})^C}$$

$$\frac{\Delta\lambda}{\lambda} \quad \simeq \quad \frac{v}{c}$$