$$F = \frac{GMm}{r^2}$$

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$v^2 = \frac{GM}{r}$$

$$v = \sqrt{\frac{GM}{r}} = \sqrt{GM}\ r^{-1/2}$$

$$v^2(R) = \frac{GM_{\rm enc}}{R}$$

$$M_{\rm enc} = \int_0^R 4\pi r^2\, dr\ \rho(r)$$

$$v \propto R$$

$$\rho(r) = \rho_0\ r^{\alpha}$$

$$M_{\rm enc} = \int_0^R 4\pi r^2\, dr\ \rho_0\ r^{\alpha} = 4\pi\rho_0 \int_0^R r^{2+\alpha}\, dr$$

$$M_{\rm enc} = \left(\frac{4\pi\rho_0}{3+\alpha}\right) R^{3+\alpha}$$

$$v^2 = \frac{GM_{\rm enc}}{R} \propto \frac{R^{3+\alpha}}{R} \propto R^{2+\alpha}$$

$$\rho(r) = \rho_0\ r^{-2.2}$$

$$\mu = -k\ r$$

$$\mu \propto \ln(I)$$

$$\ln(I) \propto -k\ r \qquad \Rightarrow \qquad I(r) \propto e^{-kr}$$