Uniform optical properties of Conics

uniform reflection property of parabola

To show that

$$\theta_i = \theta_r$$

PROOF: Given two lines ℓ_1 and ℓ_2 with slopes m_1 and m_2 the tangent of the angle between them is given by:

$$\frac{m_2 - m_1}{1 + m_1 m_2}$$

- slope of tangent line is $2p/b$ so slope of the normal line is $-b/2p$.
- slope of reflected ray is 0.
- slope of slope of incident ray is $\frac{b-p}{a}$.
- So $\tan\theta_i = \dfrac{\frac{b-p}{a} + \frac{b}{2p}}{1 + \frac{b-p}{a}\frac{b}{2p}}$
- and $\tan\theta_r = \frac{-b}{2p}$
- easy exercise to show that $\tan\theta_i = \tan\theta_r$ and therefore $\theta_i = \theta_r$