1 Closed Kepler Orbits in Cartesian Coordinates

The general solution of the orbital path of the relative position of two particles in polar coordinates (r, θ) can be written as

$$\frac{\alpha}{r} = 1 + \epsilon \cos\theta \tag{1.1}$$

where α and ϵ are constants that depend on initial conditions.

Show that equation 1.1 can be written in Cartesian coordinates, $x = r\cos\theta$ and $y = r\sin\theta$, as

$$\frac{(x+d)^2}{a^2} + \frac{y^2}{b^2} = 1\,. \tag{1.2}$$

So find a, b, and d, as a function of α and ϵ.