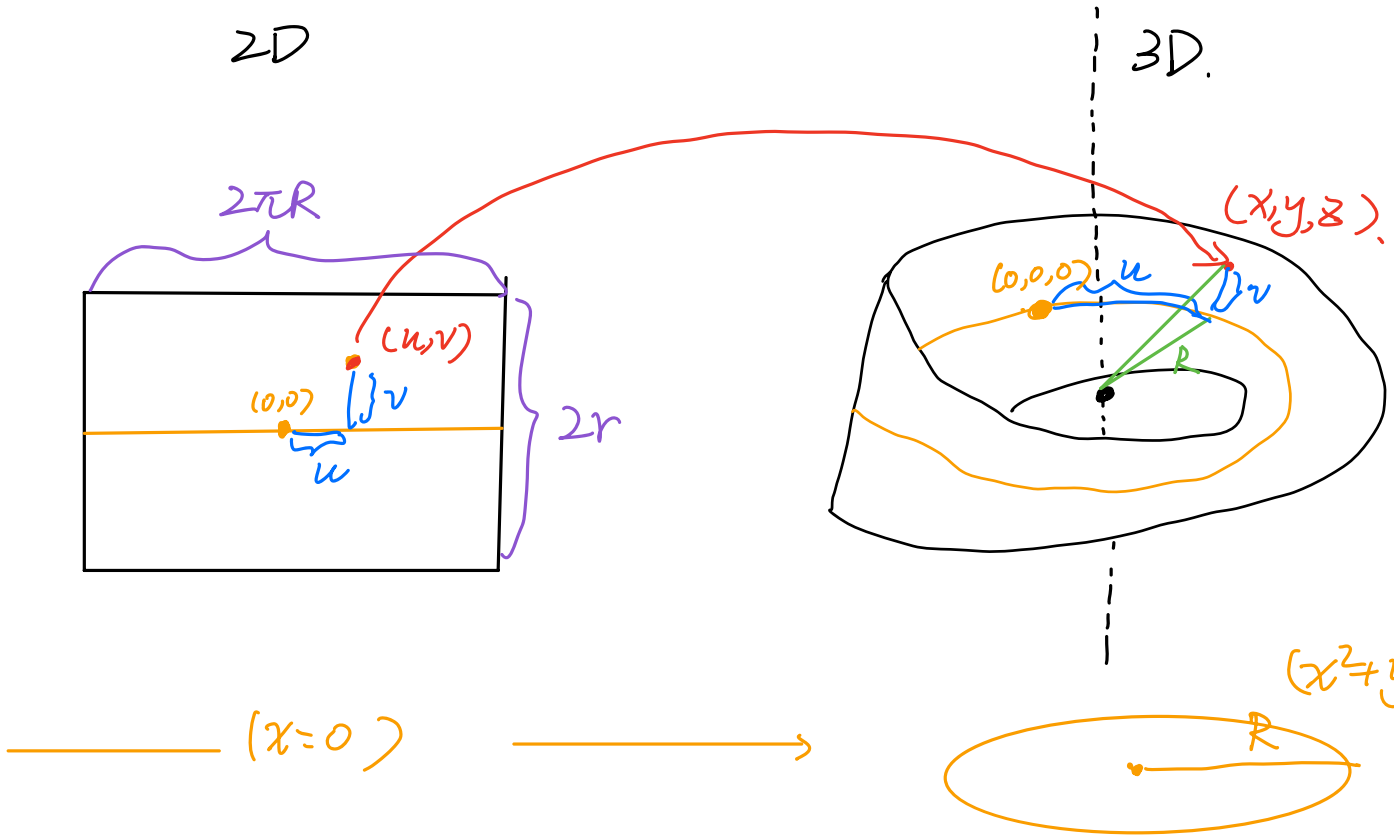
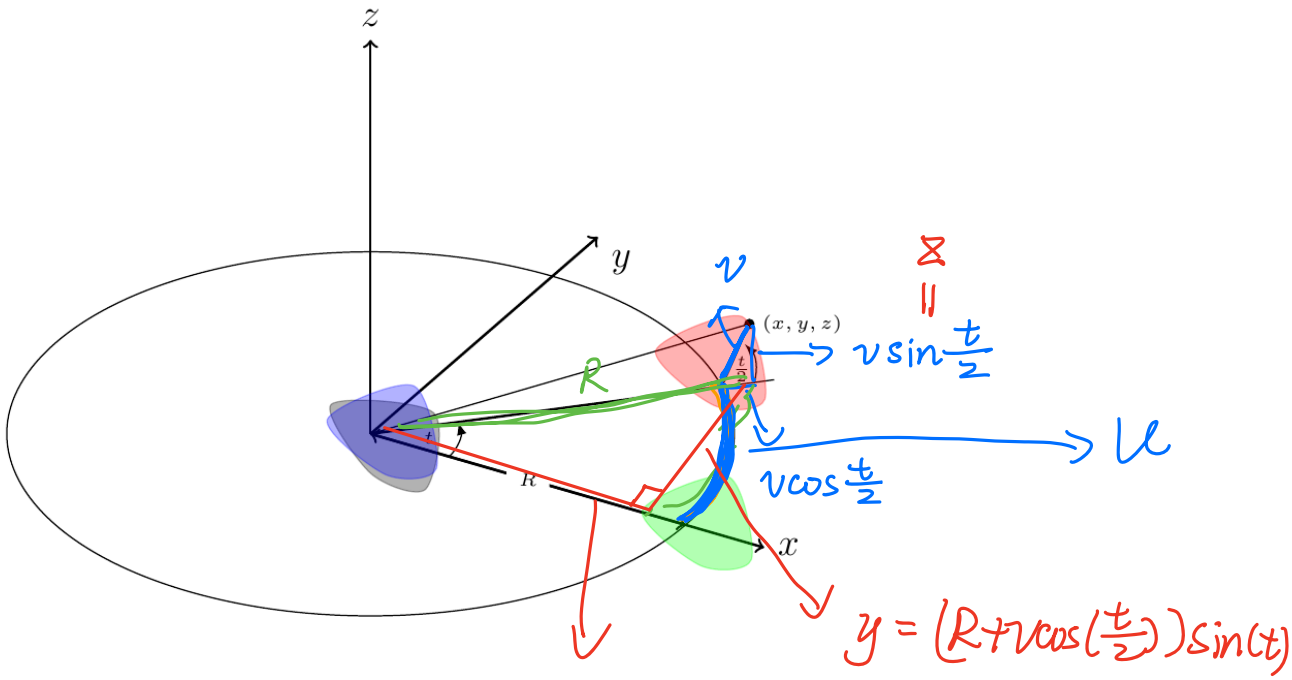




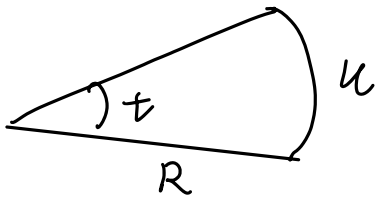
$$x = (R + v\cos(\tfrac{t}{2}))\cos(t)$$

$t \in [0, 2\pi]$ $\quad v \in [-r, r]$.

Parametrization

$$X(t,v) = \left((R + v\cos(\tfrac{t}{2}))\cos(t),\ (R + v\cos(\tfrac{t}{2}))\sin(t),\ v\sin(\tfrac{t}{2}) \right)$$

t, u relationship:



in radian ($360° = 2\pi$)

$$tR = u$$

$$t = \frac{u}{R}$$

$$X(u,v) = \left(\left(R + v\cos\left(\frac{u}{2R} \right) \right) \cos\left(\frac{u}{R}\right),\ \left(R + v\cos\left(\frac{u}{2R} \right) \right) \sin\left(\frac{u}{R}\right),\ v\sin\left(\frac{u}{2R}\right) \right)$$

Inverse Mapping

$$x = \left(R + v\cos\left(\frac{u}{2R}\right)\right)\cos\left(\frac{u}{R}\right)$$

$$y = \left(R + v\cos\left(\frac{u}{2R}\right)\right)\sin\left(\frac{u}{R}\right)$$

$$z = v\sin\left(\frac{u}{2R}\right)$$

$$\frac{y}{x} = \tan\left(\frac{u}{R}\right) \Rightarrow u = R\arctan\left(\frac{y}{x}\right)$$

$$z = v\sin\left(\frac{u}{2R}\right) \Rightarrow v = \frac{z}{\sin\left(\frac{u}{2R}\right)} = \frac{z}{\sin\left(\frac{\arctan\left(\frac{y}{x}\right)}{2}\right)}$$