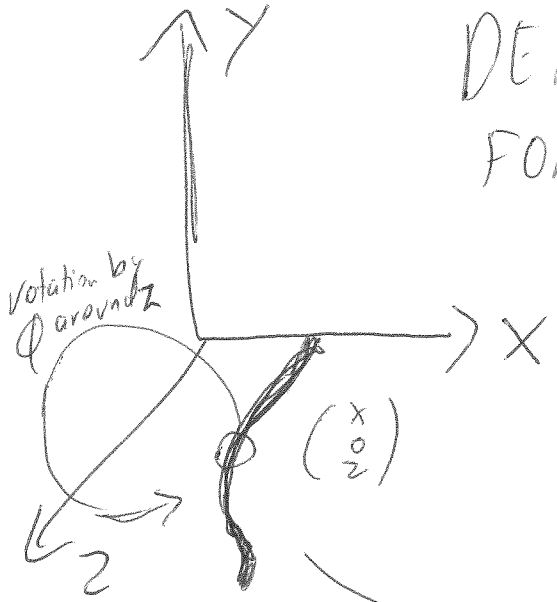
DERIVATION OF FORMULA FOR SURFACE OF REVOLUTION



curve $c(t) = \begin{pmatrix} x(t) \\ 0 \\ z(t) \end{pmatrix}$

Let's rotate the point $\begin{pmatrix} x \\ 0 \\ z \end{pmatrix}$ around the z-axis by an angle of φ:

$$\Rightarrow p(\varphi) = \begin{pmatrix} \cos\varphi & -\sin\varphi & 0 \\ \sin\varphi & \cos\varphi & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ 0 \\ z \end{pmatrix} = \begin{pmatrix} \cos\varphi \cdot x \\ \sin\varphi \cdot x \\ z \end{pmatrix}$$

If we describe the rotation by a parameter $2\pi s$ $(s \in [0,1])$ we get the circle

$$p(s) = \begin{pmatrix} x \cos(2\pi s) \\ x \sin(2\pi s) \\ z \end{pmatrix}$$

If we do this rotation for all points $\begin{pmatrix} x(t) \\ 0 \\ z(t) \end{pmatrix}$ on the profile curve we get the surface

$$p(s,t) = \begin{pmatrix} x(t) \cos(2\pi s) \\ x(t) \sin(2\pi s) \\ z(t) \end{pmatrix}$$