c) let $\alpha = \beta$. What is the maximal velocity achieved by the end effector (L and α should appear in your answer), and in which configuration is it achieved. Do you have an intuitive explanation?

$$|V|^2 = [\alpha^2(-\sin\alpha\cos\alpha - \cos\alpha\sin\alpha)^2 + \alpha^2(\cos\alpha\cos\alpha - \sin\alpha\sin\alpha)^2 + \alpha^2\cos^2\alpha]L^2$$

$$= \alpha^2[(-2\sin\alpha\cos\alpha)^2 + (\cos^2\alpha - \sin^2\alpha)^2 + \cos^2\alpha]L^2$$

$$= \alpha^2[4\sin^2\alpha\cos^2\alpha + \cos^4\alpha - 2\sin^2\alpha\cos^2\alpha + \cos^4\alpha + \cos^2\alpha]L^2$$

$$= \alpha^2[\cos^4\alpha + 2\sin^2\alpha\cos^2\alpha + \cos^4\alpha + \cos^2\alpha]L^2$$

$$= \alpha^2[(\sin^2\alpha + \cos^2\alpha)^2 + \cos^2\alpha]L^2$$

$$= \alpha^2L^2(1 + \cos^2\alpha)$$

$$|V| = \alpha L\sqrt{1+\cos^2\alpha}$$

Max when $\cos^2\alpha$ is maximum, or when $\theta_2 = 0$ which makes sense because it will have the largest radial distance from the center of rotation

d) **[extra credit]** What is the trajectory of the end effector