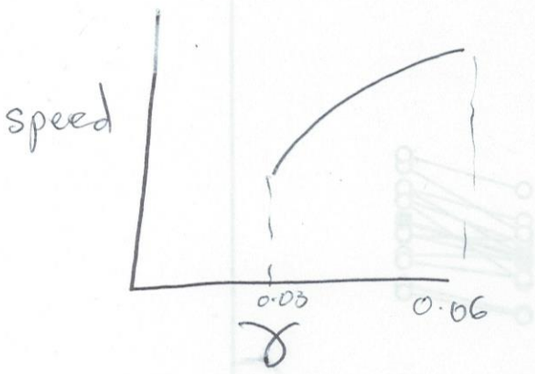
Q4A) How does slope affect speed?



$$\dot{\theta}^{+}_{xx} = -\sqrt{\frac{4\sin\alpha \cdot \gamma}{\sin(2\alpha)^2}} \cdot \cos 2\alpha$$

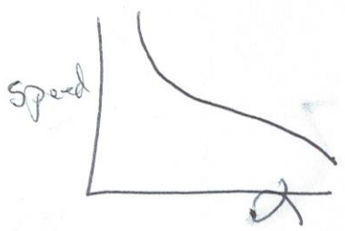
~~higher slopes mean~~

$\therefore$ angular velocity $\dot{\theta} \propto \sqrt{\gamma}$

Below $\gamma = 0.03$, the walker is unable to take a step with ICs $[0.3, -0.5]$

If slope is too low, the wheel ~~does~~ not ~~gain~~ have enough ~~energy~~ Potential energy to complete a step.

4B)

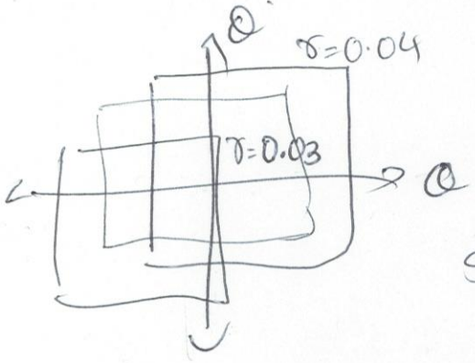


more interleg angle means less energy transferred at collision

$$\dot{\theta}^{+} = (\cos 2\alpha)\dot{\theta}^{-}$$

As α grows, less $\dot{\theta}^{+}$ for next step. Eventually wheel won't take a step, ~~beg~~ if $\alpha > 0.83$

4 c) For each slope γ, there is a phase space $[0, \dot{\theta}]$ which will converge to a limit cycle. Like a basin of attraction. If we change the slope or any other parameter, there should be overlap between the phase space of the old & new parameter.



By seeding the search for limit cycles for parameter $p_1 + \Delta$, with the values for parameter p_1, there is more chance of being within basin of attraction. If we used the same initial guess, we may end up outside the viable phase space.