$$\frac{dx}{dt} = v * cos(\theta)$$

$$\frac{dy}{dt} = v * sin(\theta)$$

$$\frac{d\theta}{dt} = \omega$$

- Choose a desired trajectory same as your team's rose curve used in the robot arm. Derive v and ω to do open loop tracking of the trajectory
- R = 0.025m is the wheel radius
- b = 0.1m is the distance between the wheel centers
- a = 1m is the rose curve radius
- Choose initial values of x, y, θ as zero for simulation
- The wheel speeds are calculated from forward and turning velocities using the following equations

$$v = \frac{R}{2}(\omega_r + \omega_l)$$

$$\omega = \frac{R}{2b}(\omega_r - \omega_l)$$

Questions:

1. (6 marks) Simulate the system using ode45 and generate the following plots (inside 2 x 4 grid of subplots)
   a. x vs y
   b. θ vs time
   c. v vs time
   d. ω vs time
   e. ω_r vs time
   f. ω_l vs time
   g. Max forward acceleration (try numerical derivative for dv/dt)
2. (4 marks) Choose motors and battery and system mass such that you can achieve the above task in hardware