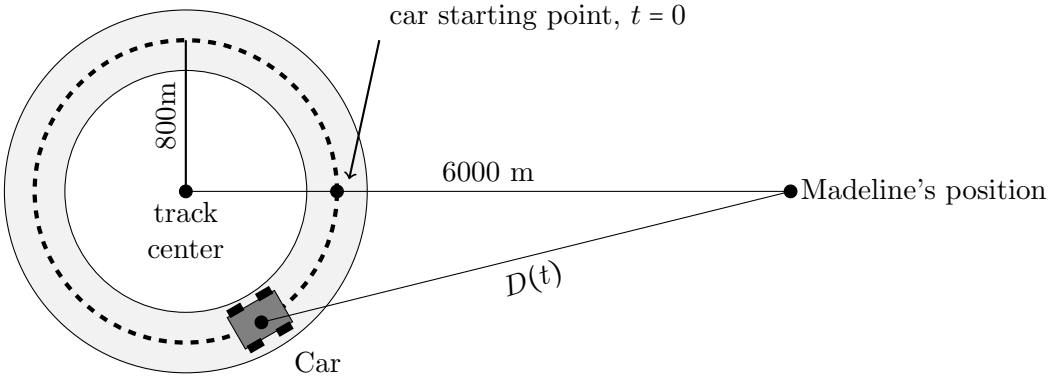
7. [10 points] Madeline is the head engineer of a new racetrack called the "Michigan Raceway". Unusually, this track will be a perfect circle. The radius a car's path will be 800m.

a. [2 points] While driving the test car, Madeline drives at a perfectly constant speed and makes one complete revolution in 1.5 minutes. How far, in meters, does Madeline drive in 40 seconds? *Show all work. Give your answer in exact form, or rounded to two decimal places.*

_____ meters

b. [4 points] While another engineer takes over the test car, Madeline stands directly east, 6000m away from **center** of the track. The car now drives at a constant speed and takes exactly 2 minutes for each lap. Let $D(t)$ be the test car's distance from Madeline, in meters, where t is measured in minutes since the car started, directly east of center.



(i) What is the minimum value of $D(t)$? _____ meters

(ii) What is the maximum value of $D(t)$? _____ meters

(iii) What is the exact value of $D(0.5)$? *Show all work.*

_____ meters

c. [4 points] If we want to *approximate* a formula for $D(t)$ using a sinusoidal function of the form $D(t) = A\cos(B(t-h)) + k$, what formula should we use? That is, use the information above to find the appropriate values for A, B, h, and k and write out the final formula.

$D(t) =$ _____