

Complete these exercises:

Section 13.1 Exercise 4

Section 13.2 Exercises 10, 20, 28, 34, 35

The race track problem below.

Viewed from above, a car racing track is in the shape of an oval: two semicircular curves joined by two straight, parallel line segments. The straight segments are 600 meters long, while the semicircles have radius 200 meters, for a total length of a little over 2400 meters.

A. Parametrize one of the semicircles using a 2D vector-valued function. Your parametrization should have speed v , where v is an unknown constant (the speed of a car traveling around the curve).

B. Suppose that, when the car passes from the curved portion of the track to the straight portion of the track, its position is continuous with respect to time. Is its velocity continuous? Is its acceleration continuous?

C. Now think about a curved segment of the track. Instead of viewing it from above, view it in cross section. The track is banked at an angle of θ relative to horizontal, to help cars take the curve at high speed. Compute the magnitude of the car's acceleration perpendicular to the surface of the track and parallel to the surface of the track, in terms of v and θ .