Math 251:05-10 **Workshop Problems #1** **February 1, 2006**

1. Find equations for two orthogonal planes both of which contain the line $\mathbf{v} = (1, 0, 3) + t(-1, 2, 1)$, one of which passes through the origin.

2.* Suppose that $\overrightarrow{a}$ is a vector in $\mathbb{R}^3$ which is not the zero vector.

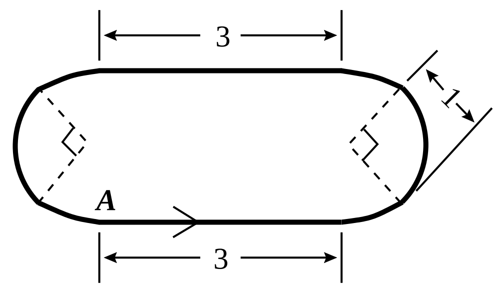
a) If $\overrightarrow{a} \cdot \overrightarrow{b} = \overrightarrow{a} \cdot \overrightarrow{c}$, does it follow that $\overrightarrow{b} = \overrightarrow{c}$?

b) If $\overrightarrow{a} \times \overrightarrow{b} = \overrightarrow{a} \times \overrightarrow{c}$, does it follow that $\overrightarrow{b} = \overrightarrow{c}$?

c) If $\overrightarrow{a} \cdot \overrightarrow{b} = \overrightarrow{a} \cdot \overrightarrow{c}$ and $\overrightarrow{a} \times \overrightarrow{b} = \overrightarrow{a} \times \overrightarrow{c}$, does it follow that $\overrightarrow{b} = \overrightarrow{c}$?

3. Is the point (1,2,3) on a tangent line of the twisted cubic $\mathbf{c}(t) = (t, t^2, t^3)$?

4. This picture of an "oval" racetrack has been drawn with some care. Dimensions are in miles. Two portions of the track are straight and two portions are circular arcs, as indicated. Imagine that you drive a car on the track for 20 miles, beginning at the point A in the direction indicated (counterclockwise). Sketch a graph of the curvature, κ, as a function of the distance driven. Briefly and clearly explain your graph.



Grading workshop problems

Your recitation instructor will indicate one of these problems whose solution is requested in one week (at the Wednesday, February 8, meeting of your recitation section). Your workshop writeup will be read either by the lecturer or the recitation instructor. Grading will be on a 10 point scale: 5 points for mathematical content and 5 points for exposition. Further explanation of what is desired will be linked to the course webpage.

* This is the textbook's problem 45 in section 12.4.