

# Differential Geometry of Curves and Surfaces

## Homework 3

*Due on October 4*

1. Compute the curvature and the torsion of the curve  $\mathbf{c} : \mathbb{R} \rightarrow \mathbb{R}^3$  given by

$$\mathbf{c}(t) = (\cos(t), \sin(t), 2\cos(t) + 3\sin(t)).$$

What can you say about this curve?

**Use a symbolic computation system, such as Mathematica, to solve this problem**

2. Consider the simple closed regular space curve  $\mathbf{c} : [0, 2\pi] \rightarrow \mathbb{R}^3$  given by

$$\mathbf{c}(t) = ((2 + \cos(3t)) \cos(2t), (2 + \cos(3t)) \sin(2t), \sin(3t)).$$

- (a) Obtain a plot of this curve. Based on this plot, is this curve the trivial knot?
- (b) Obtain a numerical estimate of its total curvature, and check that it is bigger than  $4\pi$ .