

## ▷ **Project 7. Fundamental Theorem of Space Curves**

Your assignment for the seventh Matlab project is to implement the Fundamental Theorem of Space Curves. That is, given a (positive) curvature function  $k : [0, L] \rightarrow \mathbf{R}$ , and a torsion function  $\tau : [0, L] \rightarrow \mathbf{R}$ , construct and plot a space curve  $x$  that has  $k$  as its curvature function and  $\tau$  as its torsion function. To make the solution unique, take the initial point of  $x$  to be the origin and its initial tangent direction to be the direction of the positive  $x$ -axis. You should also use `plot3` to plot the curve. See if you can create an animation that moves the Frenet Frame along the curve. For uniformity, name your M-File `SpaceCurveFT`, and let it start out:

```
function      x = SpaceCurveFT(k,tau,L)
```

Note that a problem analagous to the one mentioned in Project # 6 will appear again hear. To get the Frenet frame along the curve you will solve the Frenet equations, and for this you can use the Runge-Kutta algorithm that you developed earlier. Then, to obtain the curve  $x$  you will need to integrate its tangent vector, i.e., the first element of the Frenet frame that you just derived, and since the tangent vector is not in the form of a Matlab function, you will need to use the version of Simpson's Rule developed for Project # 6 where the input is a matrix that contains the values of the integrand at the nodes.