Supplementary Exercises for Section 12.3

1. Find the length of the curve $\mathbf{r}(t) = \langle 2t, t^2, \ln(t) \rangle$ between the points $(2, 1, 0)$ and $(4, 4, \ln(2))$
2. Find $\mathbf{T}$ and $\mathbf{N}$ for the function $\mathbf{r}(t) = \langle \sqrt{2}t, e^t, e^{-t} \rangle$.
3. Find $\mathbf{T}$, $\mathbf{N}$ and $\mathbf{B}$, and use them to find the normal and osculating planes to $\mathbf{r}(t) = \langle 3\cos(2t), t, 3\sin(2t) \rangle$ at the point $(3, \pi, 0)$.
4. The binormal vector to a curve can be viewed as a function of time, $\mathbf{B}(t)$. Show that $\mathbf{B}'(t)$ is a scalar multiple of $\mathbf{N}(t)$. (You can argue that $\mathbf{B}'(t)$ is perpendicular to both $\mathbf{T}(t)$ and $\mathbf{B}(t)$).