1. Find a function $\vec{r}(t)$ that describes the intersection of the cone $x^2 + y^2 = z^2$ with the plane $x - z - 2 = 0$.

2. Verify that the curve $\vec{r}(t) = (t\cos t)\vec{\imath} + (t\sin t)\vec{\jmath} + t\vec{k}$ lies on the surface $x^2 + y^2 = z^2$

3. Show that the curve $\vec{r}(t) = \langle a + \cos t + b \sin t, c \cos t + d \sin t, e \cos t + f \sin t \rangle$ where a, b, c, d, e, f are real numbers lies in a plane (maybe want to find the equation of said plane).

4. Differentiate $\vec{r}(t) = \langle 4, 3 \cos 2t, 2 \sin 3t \rangle$.

5. $\dfrac{d}{dt}(t^2(\vec{\imath} + 2\vec{\jmath} - 2t\vec{k}) \cdot (e^t\vec{\imath} + 2e^t\vec{\jmath} - 3e^{-t}\vec{k}))$

6. $\int te^t\vec{\imath} + t\sin t^2\vec{\jmath} - \dfrac{2t}{\sqrt{t^2+4}}\vec{k}\,dt$

7. Find a function $\vec{r}(t)$ satisfying the initial value problem

$$\vec{r}\,'(t) = \langle e^t, \sin t, \sec^2 t\rangle; \vec{r}(0) = \langle 2, 2, 2\rangle$$

8. $\displaystyle\int_0^{\ln 2} (e^t\vec{\imath} + e^t\cos(\pi e^t)\vec{\jmath})\,dt$

9. Find the equation of the line tangent to the curve $\vec{r}(t) = \langle 2+\cos t, 3+\sin 2t, t\rangle$ at $t_0 = \dfrac{\pi}{2}$.