1. Consider the following data taken on a falling ball:

t (sec)	1	2	3	4	5	6	7	8	9	10
d (cm)	5	19	44	78	123	176	240	313	396	489

Find the best quadratic model going through these data. Plot both the data (as points) and the model.

2. Consider the equation of the sphere given by:

$$x^2 + y^2 + z^2 = 9.$$

a. The sphere can be represented parametrically by the vector

$$\mathbf{r}(u, v) = [3\cos(u)\sin(v), 3\sin(u)\sin(v), 3\cos(v)], \quad 0 \le u \le 2\pi, \quad 0 \le v \le \pi.$$

Graph the sphere maintaining the proper dimensions (using the CONSTRAINED option).

b. Use Maple to find the volume and surface area of the sphere.

3. Work Problems 8.5, 8.9, and 8.15 (p. 94) from the text.

a. **8.5 (Inner Product)**. Find $2\mathbf{b} \cdot 5\mathbf{c}$ and $10\mathbf{b} \cdot \mathbf{c}$, where $\mathbf{b} = [2, 0, -5]$ and $\mathbf{c} = [4, -2, 1]$.

b. **8.9 (Scalar Triple Product)**. Find $(\mathbf{a} \times \mathbf{b}) \cdot \mathbf{c}$ and $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$, where $\mathbf{a} = [1, 2, 0]$, $\mathbf{b} = [-3, 2, 0]$, and $\mathbf{c} = [2, 3, 4]$.

c. **8.15 (Length of a Curve)**. Find the length of the **catenary** $\mathbf{r} = [t, \cosh(t)]$ from $t = 0$ to $t = 1$. Plot this portion of the curve.

4. Work Problems 9.12 and 9.20 (p. 106) from the text.

a. **9.12 (Surface integral)**. Find the flux integral of $\mathbf{F} = [x^2, y^2, z^2]$ over the **helicoid** $\mathbf{r} = [u\cos(v), u\sin(v), 3v]$, where $0 \le u \le 1$, $0 \le v \le 2\pi$. Sketch the surface. Also, show the flow field going through this surface. Explain the name of the surface.

b. **9.20 (Stokes' Theorem)**. Using Stokes' theorem, integrate the tangential component of $\mathbf{F} = [e^z, e^z\sin(y), e^z\cos(y)]$ around the boundary of the surface $S = \{(x, y, z) | z = y^2, 0 \le x \le 4, 0 \le y \le 2\}$.