Exercise 3.5.91

The figure below shows data for a tumor called Jensen’s Rat Sarcoma, giving the diameter of tumors (which are approximately spherical) over time. You can see that the diameter of each of the four tumors grows as a linear function of time.

Untitled.tiff

Why should tumor growth show such a simple pattern? In each question, suppose that the tumor can be modeled as a sphere.

(a) Suppose that every cell in the tumor multiplies at a constant per capita rate, and that the tumor volume is proportional to the number of cells. Thus the tumor volume will grow at a constant per capita. Can this explain the data? Why or why not?

(b) Suppose that only cells on the surface of the tumor multiply, and they do so at a constant per capita rate. Further, suppose that the number of cells on the surface is proportional to the surface area of the tumor. Thus the tumor surface area will grow at a constant per capita. Can this explain the data? Why or why not?

Source: Mayneord, W.V. 1932. On a law of growth of Jensen’s Rat Sarcoma. American Journal of Cancer 16:841-846