MA 203
Tutorial 2

1. Suppose that a spherical droplet of a liquid evaporates at a rate that is proportional to its surface area.

$$\frac{dV}{dt} = -kA$$

where V = volume(mm^3), t = time(min), k = the evaporation rate(mm/min), and A = surface area(mm^2). Use Euler's method to compute the volume of the droplet from t = 0 to 10 min using a step size of 0.25 min. Assume that k = 0.1 mm/min and that the droplet initially has a radius of 3 mm. Assess the validity of your results by determining the radius of your final computed volume. Calculate the average evaporation rate (change in radius/time) and verify that it is consistent with the given evaporation rate.

2. Use zero- through third order Taylor series expansions to predict $f(3)$ for

$$f(x) = 25x^3 - 6x^2 + 7x - 88$$

Using a base point at $x = 1$. Compute the true percent relative error ϵ_t for each approximation.

3. The Nth Taylor polynomial for $f(x) = \log x$ expanded about $x_0 = 1$ is

$$P_N = \sum_{i=1}^{N} \frac{(-1)^{(i+1)}}{i}(x-1)^i;$$

and the value of $\log 1.5$ to eight decimal places is 0.40546511. Write an algorithm to determine the minimal value of N required for

$$|\log 1.5 - P_N(1.5)| < 10^{-5},$$

without using the Taylor polynomial remainder term.