

Modelling with numerical methods



All questions on this sheet relate to the function:

$$f(t) = (t + 0.4)e^{(4.4 - 0.1t^2)} - 0.1$$

This function models the number (in thousands) of bacteria, t minutes after the start of an experiment.

Gold

Find an approximation to the value of t at which the model predicts the population will be 0. Do this using one iteration of the Newton–Raphson method, taking 9.5 as the first approximation, and giving your answer to 3 decimal places.

Silver

The model states that the population will be largest at sometime between 2 and 3 minutes after the start of the experiment. Find the value of t when this occurs, giving your answer to 2 decimal places.

Bronze

- a Determine the initial size of the population, to the nearest thousand, of bacteria according to the model.
- b Show that, according to the model, the population of the bacteria is zero somewhere 9 to 10 minutes after the start of the experiment.