

13. A treatment is used to reduce the concentration of nitrate in the water in a pond.

The concentration of nitrate in the pond water, N ppm (parts per million), is modelled by the equation

$$N = 65 - 3e^{0.1t} \quad t \in \mathbb{R} \quad t \geq 0$$

where t hours is the time after the treatment was applied.

Use the equation of the model to answer parts (a) and (b).

(a) Calculate the **reduction** in the concentration of nitrate in the pond water in the first 8 hours after the treatment was applied.

(3)

For fish to survive in the pond, the concentration of nitrate in the water must be no more than 20 ppm.

(b) Calculate the minimum time, after the treatment is applied, before fish can be safely introduced into the pond.

Give your answer in hours to one decimal place.

(3)

(c) State a limitation of this model.

(1)