uestion 1

The population of honey bees in a region is infected by a parasite that kills off bees, so that the number of bees decreases with time. Numbers of bees are usually measured by the number of 'colonies' (groups of bees living together) since it is very difficult to measure the exact number of bees (there may be up to 60 000 bees in a colony).

Suppose that $n(t)$ is the number of bee colonies in the region at time t (in years). Assume that the number of bee colonies is modelled by the exponential decay function

$$n(t) = Ae^{kt} \quad (t \geq 0),$$

where A and k are constants. After 5 years there were 179 000 colonies, and after 25 years the number of colonies remaining was only 83 000.

(a) Find the values of the constants A and k, correct to three significant figures. [4]

(b) How many colonies does the model predict will be present after 30 years? Give your answer to the nearest thousand. [2]

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