

16 In this question you must show detailed reasoning

The population of puffins on a remote island is estimated to be $P = 58.5$, where P is measured in thousands of birds.

Just after this estimate is made there is a serious oil spill in the area. It is noted that there is a rapid decline in the population of puffins on the island.

The situation is modelled by the differential equation

$$\frac{dP}{dt} = (72t - 108)e^{-0.8t}, \text{ where } t \text{ is the time in years after the pollution incident.}$$

(a) Determine an expression for P in terms of t . **[7]**

(b) Determine whether, according to the model, P will recover to 58.5. You may assume that $\lim_{t \rightarrow \infty} te^{-0.8t} = 0$. **[2]**