

Question 16**(8 marks)**

A group of biologists has decided that colonies of a native Australian animal are in danger if their populations are less than 1000. One such colony had a population of 2300 at the start of 2011. The population was growing continuously such that $P = P_0 e^{0.065t}$ where P is the number of animals in the colony t years after the start of 2011.

- (a) Determine, to the nearest 10 animals, the population of the colony at the start of 2014. (2 marks)
- (b) Determine the rate of change of the colony's population when $t = 2.5$ years. (2 marks)
- (c) At the beginning of 2017, a disease caused the colony's population to decrease continuously at the rate of 8.25% of the population per year. If this rate continues, when will the colony become 'in danger'? Give your answer to the nearest month. (4 marks)