Question 6 **(11 marks)**

A beekeeper is starting a new colony of bees. The population B of bees, in thousands, is given by

$$B(t) = 4e^{1.4t}$$

where t is the number of years since the establishment of the colony.

(a) Determine the initial population of the bee colony. (1 mark)

(b) Determine the increase in the population of the bee colony in the first six months. (2 marks)

(c) Determine the rate of population growth two years after the establishment of the colony. (2 marks)

(d) After how many years will the rate of population growth be 65 000 bees/year? (2 marks)

After three years, the beekeeper notices that the number of bees begins to decline. The declining population, b, in thousands, has the form $b(t) = Ae^{rt}$ where t is the number of years since the start of the decline.

(e) Determine A and r if one year after the start of the decline the bee population is 100 000. (4 marks)