Question 8 (12 marks) Use the Question 8 Writing Booklet.

(a)   Assume that the population, P, of cane toads in Australia has been growing at a   **4**
rate proportional to P. That is, $\dfrac{dP}{dt} = kP$ where k is a positive constant.

There were 102 cane toads brought to Australia from Hawaii in 1935.

Seventy-five years later, in 2010, it is estimated that there are 200 million cane
toads in Australia.

If the population continues to grow at this rate, how many cane toads will there
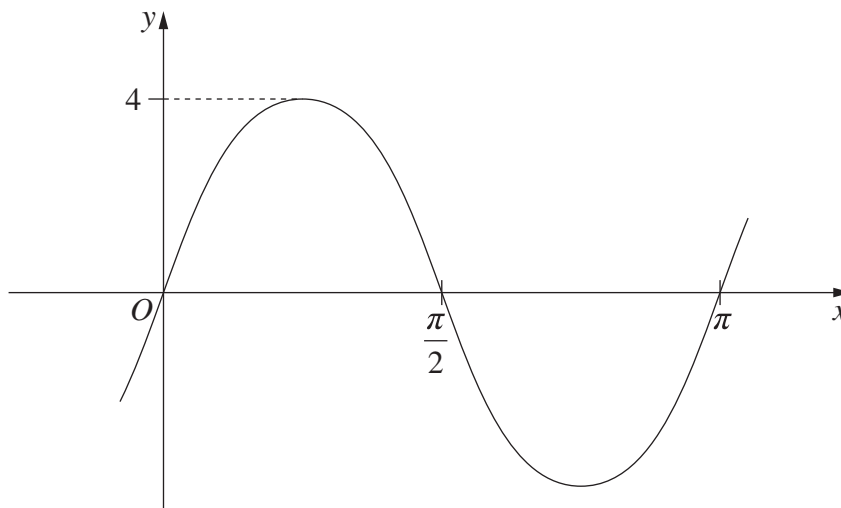be in Australia in 2035?

(b)   Two identical biased coins are tossed together, and the outcome is recorded.   **2**
After a large number of trials it is observed that the probability that both coins
land showing heads is 0.36.

What is the probability that both coins land showing tails?

Question 8 continues on page 13

Question 8 (continued)

(c)   The graph shown is $y = A \sin bx$.

   (i)   Write down the value of A.   **1**

   (ii)   Find the value of b.   **1**

   (iii)   Copy or trace the graph into your writing booklet.   **2**

           On the same set of axes, draw the graph $y = 3 \sin x + 1$, for $0 \leq x \leq \pi$.

(d)   Let $f(x) = x^3 - 3x^2 + kx + 8$, where k is a constant.   **2**

       Find the values of k for which $f(x)$ is an increasing function.

End of Question 8