**Self-assessment: 2 Exponents and logarithms**

**1. Do not use a calculator to answer this question.**

(a) Find the exact value of 3 log(5) – log(20) + log(16).

(b) Given that *x* = ln 2, *y* = ln 3 and *z* = ln 5, express ln in terms of *x*, *y* and *z*.

(c) If ln *K* = 2 – ln *c*, find and simplify an expression for *K* in terms of *c*.

*(accessible to students on the path to grade 3 or 4)* *[6 marks]*

**2.** **Do not use a calculator to answer this question.**

Solve the following equation:

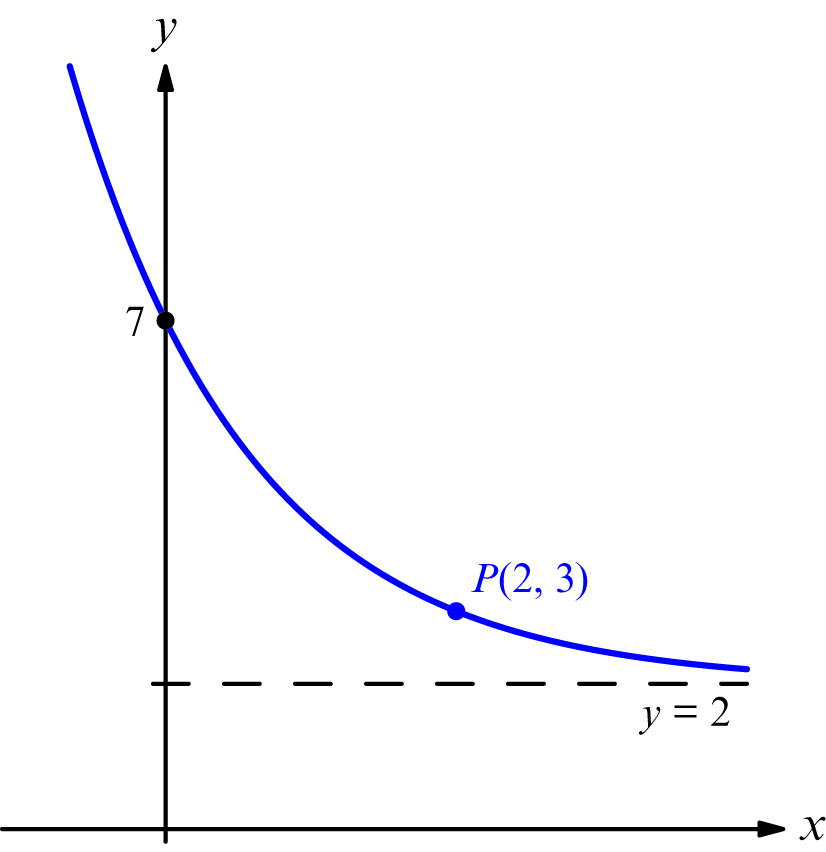
log2 (*x* + 2) – log2 *x* = 3

*(accessible to students on the path to grade 3 or 4)* *[3 marks]*

**3.** Find the exact solutions of the equation,

3e2*x* – 7e*x* + 2 = 0

*(accessible to students on the path to grade 5 or 6) [5 marks]*

**4.** The diagram shows the graph with equation *y* = *C* + *A*e−*kt*. The graph passes through the point P(2, 3). 

(a) Write down the value of *C* and the value of *A*.

(b) Find the exact value of *k*.

*(accessible to students on the path to grade 5 or 6) [5 marks]*

**5.** (a) The population of bacteria increases according to an exponential model, *N* = *A* × *bkt*, where *N* is the number of bacteria after *t* minutes and *A* and *b* are positive constants. Given that initially there were 50 bacteria and that after three minutes the number has grown to 270,

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

(ii) Show that, to three significant figures, *bk* = 1.75.

(iii) Find the size of the population after five minutes.

(b) After five minutes the population growth slows down, so that now it follows the new model,

*N* = 2000 – *M*e−0.47*t*.

(i) Find the value of *M*.

(ii) According to this model, the size of the population approaches a limit in the long term. Find this limit.

(iii) How long does it take for the population size to reach1999? Give your answer to the nearest minute.

*(accessible to students on the path to grade 5 or 6) [11 marks]*