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

**1.** (a) log(53 ÷ 20 × 16) = log  = log(5 × 5 × 4) = log(100) = 2 *[2 marks]*

(b)  = ln 5 + 2 ln 3 – 2 ln 2 = *z* + 2*y* – 2*x* *[2 marks]*

(c) ln *K* = 2 – ln *c* ⇔ *K* = 22 – ln *c* =  *[2* *marks]*

**2.** log2  **=** 23= 8 ⇔ *x* + 2 = 8*x* ⇔ *x* = *[3 marks]*

**3.** Substitute *y* = e*x*:

3*y*2 – 7*y* + 2 = 0

⇔ (3*y* −1)(*y* – 2) = 0

⇔ *y* =  or *y* = 2

⇔ *x* = ln = −ln 3 or *x* = ln 2*[5marks]*

**4.** (a) *C* = 2, 2 + *A* = 7 ⇒ *A* = 5

(b) 3 = 2 + 5e –*k* × 2 ⇔ e −2*k* =  ⇔ e2*k* = 5 ⇔  *k* =  *[5 marks]*

**5.** (Note that exact values have been used in the calculations for parts (a) (iii), (b) (i) and (iii).)  
  
(a) (i) *A* = 50

(ii) *t* = 3, *N* = 270 ⇒ 270 = 50 × *b*3*k*

⇒ *b*3*k* =  = 5.4 ⇒ (*bk*)3 = 5.4 ⇒ *bk* =  = 1.75 (3SF)

(iii) *N* = 50 × *b*5*k* = 50 × (*bk*)5 = 50 × (1.75)5 = 831 (3SF) *[6 marks]*

(b) (i) When *t* = 5: 2000 – *M*e−0.47 × 5 = 831 ⇒ *M* =  = 12300 (3SF)

(ii) When *t* is large, e−0.47*t* → 0, so  *N* → 2000

(iii) 1999 = 2000 – 12300e −0.47*t* ⇔ e −0.47*t* =  = 20 minutes (Part (iii) can also be done by drawing the graph on your GDC.) *[5 marks]*