Edexcel AS Maths Exponentials & logarithms

Section 2: Natural logarithms and exponentials

Exercise level 1

1. Use your calculator to work out the value of
   (i) e^2
   (ii) e^{-3}
   (iii) $e^{-0.6}$
   (iv) $\ln 2$
   (v) $\ln 0.3$
   (vi) $\ln 5$

2. Solve each of the following equations
   (i) $e^x = 2$
   (ii) $e^{2x-1} = 3$
   (iii) $e^x = 2e^{1-2x}$
   (iv) $\ln x = 5$
   (v) $\ln x^2 = -2$
   (vi) $\ln x = 3 - \ln 2x$

3. Find $\dfrac{dy}{dx}$ for each of the following:
   (i) $y = e^{2x}$
   (ii) $y = e^{-x}$
   (iii) $y = 2e^{-3x}$

4. Sketch the graphs of $y = \ln x$ and $y = e^x$ on the same axes.
   What is the geometrical relationship between these two curves?

5. The number of bacteria, N, in a colony at time t, where t is measured in hours, is given by the equation
$$N = 1000e^{0.2t}.$$
   (i) How many bacteria are there after 2 hours?
   (ii) After how long has the number of bacteria doubled?

6. The temperature $T°C$ of a hot liquid in a cool room after t minutes is given by the equation
$$T = 18 + 80e^{-0.5t}.$$

   (i) What is the temperature of the liquid initially?
   (ii) Sketch a graph of the temperature of the liquid against time.
   (iii) What is the temperature of the liquid after 10 minutes?
   (iv) After how long is the temperature of the liquid 25°C?
   (v) What do you think the temperature of the room is?