Section 1: Exponential functions and logarithms

Exercise level 1

1. Rewrite each of these statements as a logarithm.

   (i) $10^3 = 1000$ (ii) $2^7 = 128$

   (iii) $10^{\frac{1}{3}} = \sqrt[3]{10}$ (iv) $2^{-3} = \frac{1}{8}$

   (v) $5^{-\frac{1}{2}} = \frac{1}{\sqrt{5}}$ (vi) $3^{\frac{3}{2}} = \sqrt{27}$

2. Find the values of the following:

   (i) $\log_2 16$ (ii) $\log_{10} 1000000$

   (iii) $\log_6 1$ (iv) $\log_4\left(\frac{1}{4}\right)$

   (v) $\log_5 \sqrt{5}$ (vi) $\log_3\left(\frac{1}{27}\right)$

   (vii) $\log_8 4$ (viii) $\log_2\left(\frac{1}{\sqrt{32}}\right)$

3. Find the value of x in each of the following:

   (i) $\log_2 x = -5$ (ii) $\log_3 x = \frac{3}{2}$

   (iii) $\log_x 64 = 2$ (iv) $\log_x\left(\frac{1}{\sqrt{5}}\right) = \frac{1}{2}$

4. Write the following as a single logarithm:

   (i) $\log 2 + \log 3$ (ii) $\log 10 - \log 2$

   (iii) $3 \log 5$ (iv) $2 \log 3 - 4 \log 2$

   (v) $\frac{1}{2}\log 3 - \frac{1}{4}\log 4$ (vi) $2 \log a + 5 \log b - 3 \log c$

5. Write as a single expression:

   (i) $\frac{1}{2}\log 2 - \frac{1}{4}\log 16$

   (ii) $4\log_{10} 3 - \log_{10} 9$

   (iii) $4\log_3 3 - \log_3 9$

   (iv) $2\log x + 3\log y - \log(x^2 y)$

   (v) $a\log b - b\log a + \log a - \log b$