MCS 121 – Exponentials and Logs

Note: log denotes $\log_{10}$

1. Write these expressions using sums and differences.

   (a) $\log(5x)$ (b) $\log(5\sqrt{x})$

   (c) $\ln(x^2/y)$ (d) $\ln \frac{1}{e^x+1}$

2. Write these expressions as single logarithms.

   (a) $4\log x + \frac{1}{2}\log y$

   (b) $\ln x^2 - \ln x$

   (c) $2(\log x + \frac{1}{2}\log(x+1))$

3. Simplify each expression (no calculators necessary).

   (a) $\log 1$ (b) $e^{\ln 5}$

   (c) $\ln e^2$ (d) $xe^{\ln x}$

   (e) $e \ln e$ (f) $\ln e^t$

   (g) $\ln \sqrt{e}$ (h) $x \ln e^x$

   (i) $e(1 + e^{\ln 3})$ (j) $\ln e$

   (k) $\log 10$ (l) $\log 10^3$

   (m) $\log(x+y)$ (n) $\ln 1$

4. Solve each equation for x.

   (a) $3^x = 7$

   (b) $5 \ln 2x = 20$

   (c) $e^{2x} = 6$

   (d) $2 \ln x - 1 = 0$

   (e) $\ln x + \ln(x+2) = \ln 15$

   (f) $e^{x-1} = \sqrt{e}$

   (g) $ce^{ax} = 1$

Check your answers:

1. (a) $\log 5 + \log x$ (b) $\log 5 + \frac{1}{2}\log x$ (c) $2\ln x - \ln y$ (d) $-\ln(e^x+1)$
2. (a) $\log(x^4\sqrt{y})$ (b) $\ln x$ (c) $\log x^2(x+1)$
3. (a) 0 (b) 5 (c) 2 (d) x^2 (e) e (f) t (g) 1/2 (h) x^2 (i) $4e$ (j) 1
   (k) 1 (l) 3 (m) $\log(x+y)$ (n) 0
4. (a) $x = 1.77$ (b) $x = 27.3$ (c) $x = 0.896$ (d) $x = \sqrt{e}$
   (e) $x = 3$ ($x = -5$ won't work) (f) $x = 3/2$ (g) $x = -1/a \ln c$