Logs 4 : Answers

44) a) Book Work

b) $5^{3x+1} = 6$

$\ln 5^{3x+1} = \ln 6$

$(3x+1)\ln 5 = \ln 6$

$(3x+1) = \frac{\ln 6}{\ln 5}$

$3x = \frac{\ln 6}{\ln 5} - 1$

$3x = 0.1133$

$x = 0.0378$ to 4 d.p.

45 a) Book Work

b) $\log_a 36 + \frac{1}{2}\log_a 256 - 2\log_a 48$

$= \log_a 36 + \log_a 256^{1/2} - \log_a 48^2$

$= \log_a 36 + \log_a 16 - \log_a 48^2$

$= \log_a\left(\frac{36 \times 16}{48 \times 48}\right)$

$= \log_a\left(\frac{1}{4}\right)$

c) $2^{x+1} = 5$

$\ln 2^{x+1} = 5$

$(x+1)\ln 2 = \ln 5$

$x+1 = \frac{\ln 5}{\ln 2}$

$x = \frac{\ln 5}{\ln 2} - 1$

$x = 1.322$ to 3 d.p.

46) a) Book Work

b) $\log_a x + \log_a (3x+4) = 2\log_a (3x-4)$ $\quad x > 4/3$

$\Leftrightarrow \log_a x(3x+4) = \log_a (3x-4)^2$

$x(3x+4) = (3x-4)^2$

$3x^2 + 4x = 9x^2 - 24x + 16$

$0 = 6x^2 - 28x + 16$

$0 = 3x^2 - 14x + 8$

$0 = (3x-2)(x-4)$

either

$3x - 2 = 0$ or $x = 4$

$x = 2/3$

But $x > 4/3$ $\therefore$ $\boxed{x = 4}$

c) $3^x = 11$

$\ln 3^x = \ln 11$

$x \ln 3 = \ln 11$

$x = \dfrac{\ln 11}{\ln 3}$

$x = 2.183$ to 3 d.p.

47) a) Book Work

b) (i)

$3^{2x-1} = 11$

$\ln 3^{2x-1} = \ln 11$

$(2x-1)\ln 3 = \ln 11$

$2x - 1 = \dfrac{\ln 11}{\ln 3}$

$2x = 2.183 + 1$

$2x = 2.183$

$x = 1.091$ to 3 d.p.

(ii) $\frac{3}{2}\log_a 16 + \log_a 6 - 2\log_a 12$

$= \log_a 16^{3/2} + \log_a 6 - \log_a 12$

$= \log_a \left(\dfrac{64 \times 6}{12}\right)$

$= \log_a 32$