Core 2 Indices & Log Questions

3 (a) Use logarithms to solve the equation $0.8^x = 0.05$, giving your answer to three decimal places. *(3 marks)*

   (b) An infinite geometric series has common ratio r. The sum to infinity of the series is five times the first term of the series.

      (i) Show that $r = 0.8$. *(3 marks)*

      (ii) Given that the first term of the series is 20, find the least value of n such that the nth term of the series is less than 1. *(3 marks)*

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7 It is given that n satisfies the equation

$$2 \log_a n - \log_a (5n - 24) = \log_a 4$$

   (a) Show that $n^2 - 20n + 96 = 0$. *(3 marks)*

   (b) Hence find the possible values of n. *(2 marks)*

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5 (a) Given that

$$\log_a x = 2 \log_a 6 - \log_a 3$$

     show that $x = 12$. *(3 marks)*

   (b) Given that

$$\log_a y + \log_a 5 = 7$$

     express y in terms of a, giving your answer in a form not involving logarithms. *(3 marks)*

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3 (a) Write down the values of p, q and r given that:

      (i) $64 = 8^p$;

      (ii) $\dfrac{1}{64} = 8^q$;

      (iii) $\sqrt{8} = 8^r$. *(3 marks)*

   (b) Find the value of x for which

$$\frac{8^x}{\sqrt{8}} = \frac{1}{64}$$

(2 marks)

1 (a) Simplify:

(i) $x^{\frac{3}{2}} \times x^{\frac{1}{2}}$; *(1 mark)*

(ii) $x^{\frac{3}{2}} \div x$; *(1 mark)*

(iii) $\left(x^{\frac{3}{2}}\right)^2$. *(1 mark)*

(b) (i) Find $\int 3x^{\frac{1}{2}}\, dx$. *(3 marks)*

(ii) Hence find the value of $\int_1^9 3x^{\frac{1}{2}}\, dx$. *(2 marks)*

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8 (a) It is given that n satisfies the equation

$$\log_a n = \log_a 3 + \log_a(2n - 1)$$

Find the value of n. *(3 marks)*

(b) Given that $\log_a x = 3$ and $\log_a y - 3\log_a 2 = 4$:

(i) express x in terms of a; *(1 mark)*

(ii) express xy in terms of a. *(4 marks)*