Chapter (6) Logarithmic and Exponential functions

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1. It is given that $log_4 x = p$. Giving your answer in its simplest form, find, in terms of *p*,

   a. $log_4(16x)$

[2]

   b. $log_4(\frac{x^7}{256})$

[2]

Using your answers to **parts (i)** and **(ii)**,

   c. solve $log_4(16x) - log_4(\frac{x^7}{256}) = 5$, giving your answer correct to 2 decimal places.

[3]

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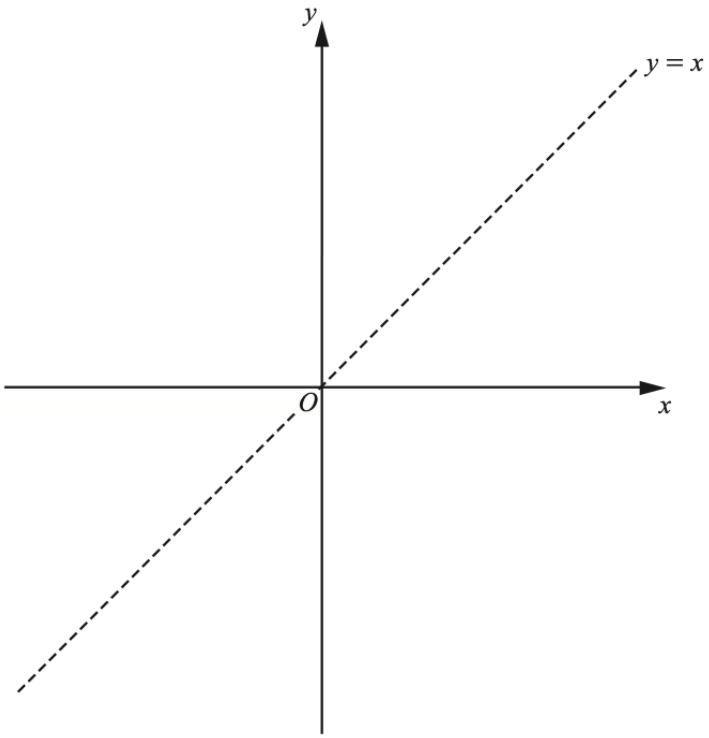
2. The function p is defined by $p(x) = 3e^{x} + 2$ for all real x.
   a. State the range of p.

[1]

   b. On the axes below, sketch and label the graphs of $y = p(x)$ and $y = p^{-1}(x)$. State the coordinates of any points of intersection with the coordinate axes.

[3]



   c. Hence explain why the equation $p^{-1}(x) = p(x)$ has no solutions.

[1]

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3. (a) Solve $log_3 x + log_9 x = 12$.

[3]

(b) Solve $log_4(3y^2 - 10) = 2log_4(y - 1) + \frac{1}{2}$.

[5]

4. It is given that $f(x) = 5e^x - 1$ for $x \in \mathbb{R}$

   a. Write down the range of f.

[1]

   b. Find f^{-1} and state its domain.

[3]

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5. $f(x) = e^{3x}$ for $x \in \mathbb{R}$

   $g(x) = 2x^2 + 1$ for $x \geq 0$

   a. Write down the range of g.

[1]

   b. Show that $f^{-1}g(\sqrt{62}) = ln\, 5$.

[3]

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6. Solve $lg(x^2 - 3) = 0$.

[2]

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7. $f(x) = 3e^{2x} + 1$ for $x \in \mathbb{R}$

$g(x) = x + 1$ for $x \in \mathbb{R}$

(a) Write down the range of f and of g.

[2]

(b) Evaluate $fg^2(0)$.

[2]

(c) On the axes below, sketch and label the graphs of $y = f(x)$ and $y = f^{-1}(x)$. State the coordinates of any points of intersection with the coordinate axes.

[3]

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8. Solve $log_7 x + 2log_x 7 = 3$.

[4]

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9. (a) Given that $log_a x = p$ and $log_a y = q$, find in terms of p and q.

(i) $log_a axy^2$

[2]

(ii) $log_a(\frac{x^3}{ay})$

[2]

(iii) $log_a x + log_y a$.

[1]

(b) Using the substitution $m = 3^x$, or otherwise, solve $3^x - 3^{1+2x} + 4 = 0$

[3]