Exponentials and Logs

A Level

Part A Sketching

Consider the curve $y = 6 \times 5^x$, sketch it and find the value of the y intercept of the curve.

What is the value of the y intercept of the curve?

The following symbols may be useful: y

Part B Find x-coordinate

The point P on the curve $y = 9^x$ has y-coordinate equal to 150. Use logarithms to find the x-coordinate of P.

Give the x-coordinate of P to 3 significant figures.

Part C New x-coordinate

The curves $y = 6 \times 5^x$ and $y = 9^x$ intersect at the point Q. Find the exact value of the x-coordinate at point Q, giving any logarithms in base three.

Give the exact value of the x-coordinate at point Q, giving any logarithms in base three $(\log_3)$.
When typing $\log_3$ into the answer box, use the syntax: $\log$(number, base), i.e. $\log_3 2 = \log(2, 3)$.

The following symbols may be useful: `log(), x`

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Finding Roots

A Level

The polynomial $f(x)$ is given by:

$$f(x) = x^3 + 6x^2 + x - 4$$

Part A Factorisation

Show that $(x + 1)$ is a factor of $f(x)$ and enter the quotient obtained when $f(x)$ is divided by $(x + 1)$.

The following symbols may be useful: `f, x`

Part B Find the roots

Find the exact roots of $f(x)$.

Give the expression for the value for the lowest, most negative root to check your answer.

The following symbols may be useful: `f, x`

Part C Sketch the graph of $f(x)$

Sketch the curve $f(x) = x^3 + 6x^2 + x - 4$ and find the coordinates of intersection with the axes.

Give the coordinate of intersection with the y-axis. Please give your answer in the form "y=", "asymptote", or "none" if there is no intersection.

Part D Logarithmic equation

Write the equation

$$2\log_2(x+3)+\log_2 x-\log_2(4x+2)=1$$

in the form $g(x)=0$, where $g(x)$ is a polynomial function of x.

Give the polynomial expression of $g(x)$.

The following symbols may be useful: `g, x`

Part E Sketch $\log_2 x$

Sketch the curve $h(x)=\log_2 x$ and find the coordinates of intersection with the axes.

Give the coordinate of intersection with the y-axis. Please give your answer in the form "y=", "asymptote" or "none" if there is no intersection.

Part F Find the root

Explain why the equation

$$2\log_2(x+3)+\log_2 x-\log_2(4x+2)=1$$

only has one real root.

State its value.

The following symbols may be useful: `x`

Adapted with permission from UCLES, A Level, June 2007, Paper 4722, Question 9.