

ALEVELS P3

LOGRITHMS
A4

- 1 (i) Show that if $y = 2^x$, then the equation

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

can be written as a quadratic equation in y . [2]

- (ii) Hence solve the equation

$$2^x - 2^{-x} = 1. [4]$$

9709/03/M/J/04

- 2 Solve the equation

$$\ln(1+x) = 1 + \ln x,$$

giving your answer correct to 2 significant figures. [4]

9709/03/O/N/04

- 3 Given that $x = 4(3^{-y})$, express y in terms of x . [3]

9709/03/M/J/06

- 4 Using the substitution $u = 3^x$, or otherwise, solve, correct to 3 significant figures, the equation

$$3^x = 2 + 3^{-x}. [6]$$

9709/03/M/J/07

- 5 Solve, correct to 3 significant figures, the equation

$$e^x + e^{2x} = e^{3x} [5]$$

9709/03/M/J/08

- 6 Solve the equation

$$\ln(x+2) = 2 + \ln x,$$

giving your answer correct to 3 decimal places. [3]

9709/03/O/N/08

- 7 Solve the equation $\ln(2 + e^{-x}) = 2$, giving your answer correct to 2 decimal places. [4]

9709/03/M/J/09

- 8 Solve the equation $\ln(5-x) = \ln 5 - \ln x$, giving your answers correct to 3 significant figures. [4]

9709/32/O/N/09

- 9 Solve the equation

$$\frac{2^x + 1}{2^x - 1} = 5,$$

giving your answer correct to 3 significant figures. [4]

9709/32/M/J/10

- 10 Solve the equation

$$\ln(1 + x^2) = 1 + 2 \ln x,$$

giving your answer correct to 3 significant figures.

[4]

9709/31/O/N/10

- 11 (i) Show that the equation

$$\log_2(x + 5) = 5 - \log_2 x$$

can be written as a quadratic equation in x .

[3]

- (ii) Hence solve the equation

$$\log_2(x + 5) = 5 - \log_2 x.$$

[2]

9709/32/M/J/11

- 12 Use logarithms to solve the equation $5^{2x-1} = 2(3^x)$, giving your answer correct to 3 significant figures.

[4]

9709/33/M/J/11

- 13 Using the substitution $u = e^x$, or otherwise, solve the equation

$$e^x = 1 + 6e^{-x},$$

giving your answer correct to 3 significant figures.

[4]

9709/31/O/N/11

- 14 Solve the equation $|4 - 2^x| = 10$, giving your answer correct to 3 significant figures.

[3]

9709/31/M/J/12

- 15 Solve the equation

$$\ln(3x + 4) = 2 \ln(x + 1),$$

giving your answer correct to 3 significant figures.

[4]

9709/32/M/J/12

- 16 Solve the equation $\ln(2x + 3) = 2 \ln x + \ln 3$, giving your answer correct to 3 significant figures.

[4]

9709/33/M/J/12

- 17 Solve the equation

$$5^{x-1} = 5^x - 5,$$

giving your answer correct to 3 significant figures.

[4]

9709/31/O/N/12

- 18 Solve the equation

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

giving your answer in terms of e .

[3]

9709/33/O/N/12

19 (i) Solve the equation $|4x - 1| = |x - 3|$. [3]

(ii) Hence solve the equation $|4^{y+1} - 1| = |4^y - 3|$ correct to 3 significant figures. [3]

9709/31/M/J/13

20 It is given that $\ln(y + 1) - \ln y = 1 + 3 \ln x$. Express y in terms of x , in a form not involving logarithms. [4]

9709/33/M/J/13

21 Solve the equation $2|3^x - 1| = 3^x$, giving your answers correct to 3 significant figures. [4]

9709/31/O/N/13

22 Given that $2 \ln(x + 4) - \ln x = \ln(x + a)$, express x in terms of a . [4]

9709/33/O/N/13

23 Solve the equation

$$2 \ln(5 - e^{-2x}) = 1,$$

giving your answer correct to 3 significant figures. [4]

9709/32/M/J/14

24 Solve the equation $\log_{10}(x + 9) = 2 + \log_{10} x$. [3]

9709/33/M/J/14

25 Use logarithms to solve the equation $e^x = 3^{x-2}$, giving your answer correct to 3 decimal places. [3]

9709/31/O/N/14

26 Use logarithms to solve the equation $2^{5x} = 3^{2x+1}$, giving the answer correct to 3 significant figures. [4]

9709/31/M/J/15

27 Using the substitution $u = 4^x$, solve the equation $4^x + 4^2 = 4^{x+2}$, giving your answer correct to 3 significant figures. [4]

9709/32/M/J/15

28 Solve the equation $\ln(x + 4) = 2 \ln x + \ln 4$, giving your answer correct to 3 significant figures. [4]

9709/33/M/J/15

29 Using the substitution $u = 3^x$, solve the equation $3^x + 3^{2x} = 3^{3x}$ giving your answer correct to 3 significant figures. [5]

9709/31/O/N/15

30 (i) Solve the equation $2|x - 1| = 3|x|$. [3]

(ii) Hence solve the equation $2|5^x - 1| = 3|5^x|$, giving your answer correct to 3 significant figures. [2]

9709/31/M/J/16

- 31 Use logarithms to solve the equation $4^{3x-1} = 3(5^x)$, giving your answer correct to 3 decimal places. [4]
9709/32/M/J/16
- 32 Solve the equation $\frac{3^x + 2}{3^x - 2} = 8$, giving your answer correct to 3 decimal places. [3]
9709/31/O/N/16
- 33 It is given that $z = \ln(y + 2) - \ln(y + 1)$. Express y in terms of z . [3]
9709/33/O/N/16
- 34 Solve the equation $\ln(x^2 + 1) = 1 + 2 \ln x$, giving your answer correct to 3 significant figures. [3]
9709/32/M/J/17
- 35 Using the substitution $u = e^x$, solve the equation $4e^{-x} = 3e^x + 4$. Give your answer correct to 3 significant figures. [4]
9709/33/M/J/17
- 36 Showing all necessary working, solve the equation $2 \log_2 x = 3 + \log_2(x + 1)$, giving your answer correct to 3 significant figures. [5]
9709/32/O/N/17
- 37 Showing all necessary working, solve the equation $\ln(x^4 - 4) = 4 \ln x - \ln 4$, giving your answer correct to 2 decimal places. [4]
9709/31/M/J/18
- 38 Showing all necessary working, solve the equation $3|2^x - 1| = 2^x$, giving your answers correct to 3 significant figures. [4]
9709/32/M/J/18
- 39 Showing all necessary working, solve the equation $5^{2x} = 5^x + 5$. Give your answer correct to 3 decimal places. [5]
9709/33/M/J/18
- 40 Showing all necessary working, solve the equation $\frac{2e^x + e^{-x}}{e^x - e^{-x}} = 4$, giving your answer correct to 2 decimal places. [4]
9709/31/O/N/18
- 41 Showing all necessary working, solve the equation

$$\frac{e^x + e^{-x}}{e^x + 1} = 4,$$
giving your answer correct to 3 decimal places. [5]
9709/32/O/N/18
- 42 Showing all necessary working, solve the equation $\ln(2x - 3) = 2 \ln x - \ln(x - 1)$. Give your answer correct to 2 decimal places. [4]
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- 43 Showing all necessary working, solve the equation $9^x = 3^x + 12$. Give your answer correct to 2 decimal places. [4]
9709/32/M/J/19

- 44 Use logarithms to solve the equation $5^{3-2x} = 4(7^x)$, giving your answer correct to 3 decimal places.
[4]
9709/33/M//19
- 45 Given that $\ln(1 + e^{2y}) = x$, express y in terms of x .
[3]
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- 46 Solve the equation $5 \ln(4 - 3^x) = 6$. Show all necessary working and give the answer correct to 3 decimal places.
[3]
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- 47 Showing all necessary working, solve the equation $\frac{3^{2x} + 3^{-x}}{3^{2x} - 3^{-x}} = 4$. Give your answer correct to 3 decimal places.
[4]
9709/33/O/N/19