

**These are P2 questions(all variants) as the syllabus is same as P3 :)**

**Q1.**

- 1 Given that  $2^x = 5^y$ , use logarithms to find the value of  $\frac{x}{y}$  correct to 3 significant figures. [3]

**Q2.**

- 2 (a) Use logarithms to solve the equation  $3^x = 8$ , giving your answer correct to 2 decimal places. [2]

(b) It is given that

$$\ln z = \ln(y + 2) - 2 \ln y,$$

where  $y > 0$ . Express  $z$  in terms of  $y$  in a form not involving logarithms. [3]

**Q3.**

- 2 The variables  $x$  and  $y$  satisfy the relation  $3^y = 4^{x+2}$ .

(i) By taking logarithms, show that the graph of  $y$  against  $x$  is a straight line. Find the exact value of the gradient of this line. [3]

(ii) Calculate the  $x$ -coordinate of the point of intersection of this line with the line  $y = 2x$ , giving your answer correct to 2 decimal places. [3]

**Q4.**

- 2 Use logarithms to solve the equation  $4^x = 2(3^x)$ , giving your answer correct to 3 significant figures. [4]

**Q5.**

- 1 Given that  $(1.25)^x = (2.5)^y$ , use logarithms to find the value of  $\frac{x}{y}$  correct to 3 significant figures. [3]

**Q6.**

- 5 (i) Given that  $y = 2^x$ , show that the equation

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

can be written in the form

$$y^2 - 4y + 3 = 0. \quad [3]$$

- (ii) Hence solve the equation

$$2^x + 3(2^{-x}) = 4,$$

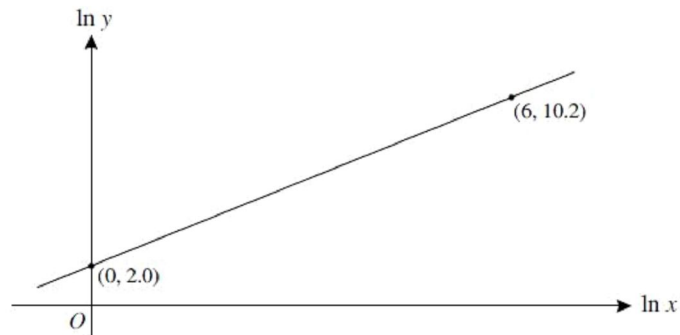
giving the values of  $x$  correct to 3 significant figures where appropriate. [3]

### Q7.

- 1 Given that  $13^x = (2.8)^y$ , use logarithms to show that  $y = kx$  and find the value of  $k$  correct to 3 significant figures. [3]

### Q8.

3



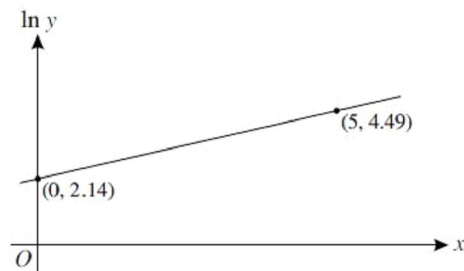
The variables  $x$  and  $y$  satisfy the equation  $y = Kx^m$ , where  $K$  and  $m$  are constants. The graph of  $\ln y$  against  $\ln x$  is a straight line passing through the points  $(0, 2.0)$  and  $(6, 10.2)$ , as shown in the diagram. Find the values of  $K$  and  $m$ , correct to 2 decimal places. [5]

### Q9.

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

### Q10.

2



The variables  $x$  and  $y$  satisfy the equation  $y = A(b^x)$ , where  $A$  and  $b$  are constants. The graph of  $\ln y$  against  $x$  is a straight line passing through the points  $(0, 2.14)$  and  $(5, 4.49)$ , as shown in the diagram. Find the values of  $A$  and  $b$ , correct to 1 decimal place. [5]

### Q11.

- 2 (i) Given that  $5^{2x} + 5^x = 12$ , find the value of  $5^x$ . [3]
- (ii) Hence, using logarithms, solve the equation  $5^{2x} + 5^x = 12$ , giving the value of  $x$  correct to 3 significant figures. [2]

### Q12.

- 2 Solve the equation  $\ln(3 - 2x) - 2 \ln x = \ln 5$ . [5]

### Q13.

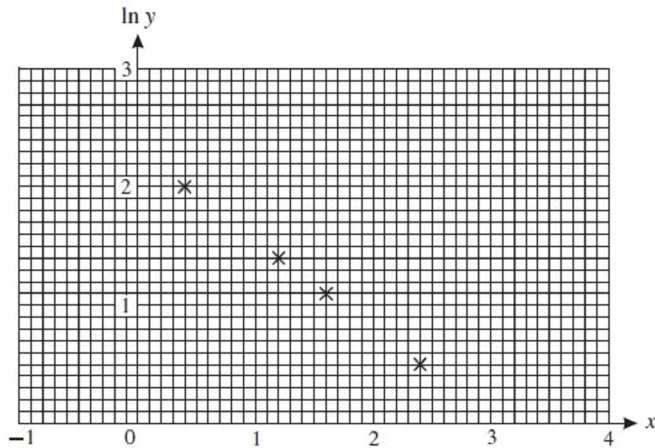
- 4 The variables  $x$  and  $y$  satisfy the equation  $5^{y+1} = 2^{3x}$ .
- (i) By taking logarithms, show that the graph of  $y$  against  $x$  is a straight line. [2]
- (ii) Find the exact value of the gradient of this line and state the coordinates of the point at which the line cuts the  $y$ -axis. [2]

### Q14.

- 3 (i) Express  $9^x$  in terms of  $y$ , where  $y = 3^x$ . [1]
- (ii) Hence solve the equation
- $$2(9^x) - 7(3^x) + 3 = 0,$$
- expressing your answers for  $x$  in terms of logarithms where appropriate. [5]

### Q15.

2



Two variable quantities  $x$  and  $y$  are related by the equation

$$y = k(a^{-x}),$$

where  $a$  and  $k$  are constants. Four pairs of values of  $x$  and  $y$  are measured experimentally. The result of plotting  $\ln y$  against  $x$  is shown in the diagram. Use the diagram to estimate the values of  $a$  and  $k$ .

[5]

### Q16.

- 2 Solve the equation  $x^{3.9} = 11x^{3.2}$ , where  $x \neq 0$ . [3]

### Q17.

- 2 (i) Express  $4^x$  in terms of  $y$ , where  $y = 2^x$ . [1]

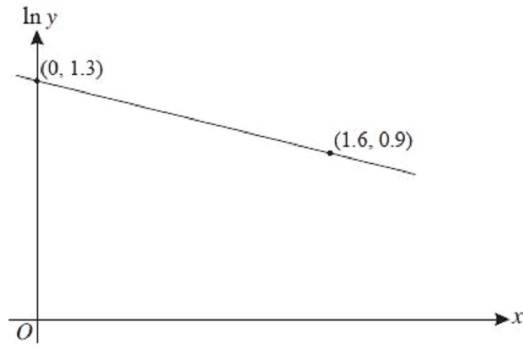
- (ii) Hence find the values of  $x$  that satisfy the equation

$$3(4^x) - 10(2^x) + 3 = 0,$$

giving your answers correct to 2 decimal places. [5]

### Q18.

3



The variables  $x$  and  $y$  satisfy the equation  $y = A(b^{-x})$ , where  $A$  and  $b$  are constants. The graph of  $\ln y$  against  $x$  is a straight line passing through the points  $(0, 1.3)$  and  $(1.6, 0.9)$ , as shown in the diagram. Find the values of  $A$  and  $b$ , correct to 2 decimal places. [5]

**Q19.**

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

**Q20.**

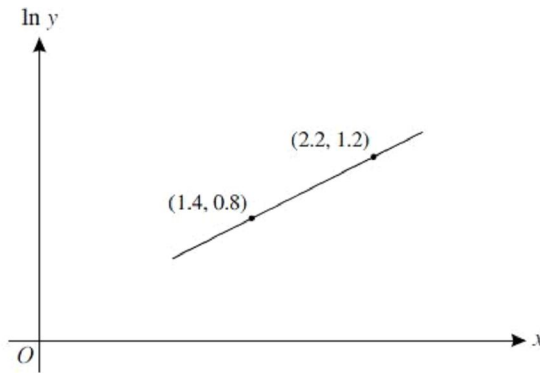
- 2 It is given that  $\ln(y + 5) - \ln y = 2 \ln x$ . Express  $y$  in terms of  $x$ , in a form not involving logarithms. [4]

**Q21.**

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

**Q22.**

5



The variables  $x$  and  $y$  satisfy the equation  $y = A(b^x)$ , where  $A$  and  $b$  are constants. The graph of  $\ln y$  against  $x$  is a straight line passing through the points  $(1.4, 0.8)$  and  $(2.2, 1.2)$ , as shown in the diagram. Find the values of  $A$  and  $b$ , correct to 2 decimal places. [6]

**Q23.**

- 4 Solve the equation  $3^{2x} - 7(3^x) + 10 = 0$ , giving your answers correct to 3 significant figures. [5]

**Q24.**

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

**Q25.**

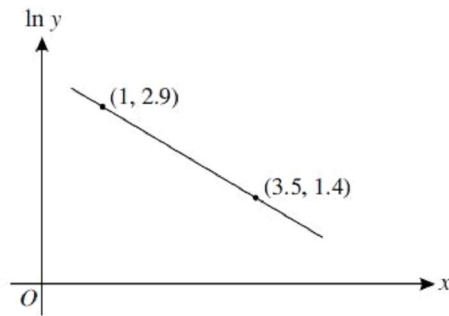
- 3 Solve the equation  $2 \ln(x+3) - \ln x = \ln(2x-2)$ . [5]

**Q26.**

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

**Q27.**

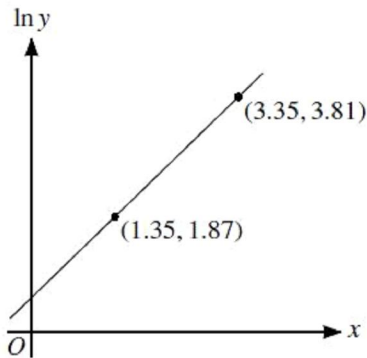
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The variables  $x$  and  $y$  satisfy the equation  $y = A(b^{-x})$ , where  $A$  and  $b$  are constants. The graph of  $\ln y$  against  $x$  is a straight line passing through the points  $(1, 2.9)$  and  $(3.5, 1.4)$ , as shown in the diagram. Find the values of  $A$  and  $b$ , correct to 2 decimal places. [6]

**Q28.**

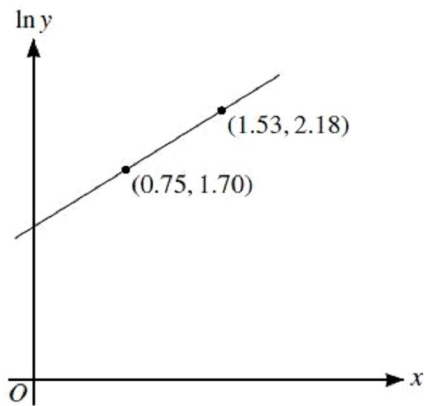
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The variables  $x$  and  $y$  satisfy the equation  $y = K(2^{px})$ , where  $K$  and  $p$  are constants. The graph of  $\ln y$  against  $x$  is a straight line passing through the points  $(1.35, 1.87)$  and  $(3.35, 3.81)$ , as shown in the diagram. Find the values of  $K$  and  $p$  correct to 2 decimal places. [6]

**Q29.**

2



The variables  $x$  and  $y$  satisfy the equation  $y = a(b^x)$ , where  $a$  and  $b$  are constants. The graph of  $\ln y$  against  $x$  is a straight line passing through the points  $(0.75, 1.70)$  and  $(1.53, 2.18)$ , as shown in the diagram. Find the values of  $a$  and  $b$  correct to 2 decimal places. [5]

### Q30.

4 (a) Find the value of  $x$  satisfying the equation  $2 \ln(x - 4) - \ln x = \ln 2$ . [5]

(b) Use logarithms to find the smallest integer satisfying the inequality

$$1.4^y > 10^{10}. \quad [3]$$

### P3 (variant1 and 3)

#### Q1.

3 The variables  $x$  and  $y$  satisfy the equation  $x^n y = C$ , where  $n$  and  $C$  are constants. When  $x = 1.10$ ,  $y = 5.20$ , and when  $x = 3.20$ ,  $y = 1.05$ .

(i) Find the values of  $n$  and  $C$ . [5]

(ii) Explain why the graph of  $\ln y$  against  $\ln x$  is a straight line. [1]

#### Q2.

2 The variables  $x$  and  $y$  satisfy the equation  $y^3 = Ae^{2x}$ , where  $A$  is a constant. The graph of  $\ln y$  against  $x$  is a straight line.

(i) Find the gradient of this line. [2]

(ii) Given that the line intersects the axis of  $\ln y$  at the point where  $\ln y = 0.5$ , find the value of  $A$  correct to 2 decimal places. [2]

#### Q3.



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

**Q4.**

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

**Q5.**

- 2 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]

**Q6.**

- 2 Solve the equation  $3^{x+2} = 3^x + 3^2$ , giving your answer correct to 3 significant figures. [4]

**Q7.**

- 2 Solve the equation

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

giving your answer correct to 3 significant figures.

[4]

**Q8.**

- 1 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]

**Q9.**

- 2 Solve the equation

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

giving your answer correct to 3 significant figures.

[4]

**Q10.**

1 Solve the equation

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

giving your answer in terms of  $e$ .

[3]

### Q11.

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

[4]

### Q12.

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

[4]

### Q13.

6 It is given that  $2 \ln(4x-5) + \ln(x+1) = 3 \ln 3$ .

(i) Show that  $16x^3 - 24x^2 - 15x - 2 = 0$ .

[3]

(ii) By first using the factor theorem, factorise  $16x^3 - 24x^2 - 15x - 2$  completely.

[4]

(iii) Hence solve the equation  $2 \ln(4x-5) + \ln(x+1) = 3 \ln 3$ .

[1]

### Q14.

1 Solve the equation  $\log_{10}(x+9) = 2 + \log_{10} x$ .

[3]

### Q15.

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

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