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# Straight lines: gradients and normals 1i

A Level



## Part A Gradient of line

Find the gradient of the line  $l_1$  which has equation  $4x - 3y + 5 = 0$ .

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## Part B Perpendicular line

Find the equation of the line  $l_2$ , which passes through the point  $(1, 2)$  and is perpendicular to the line  $l_1$ , giving your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers.

The following symbols may be useful:  $x$ ,  $y$

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## Part C Midpoint

The line  $l_1$  crosses the  $x$ -axis at  $P$  and the line  $l_2$  crosses the  $y$ -axis at  $Q$ . Find the coordinates of the midpoint of  $PQ$ .

Enter the  $x$ -coordinate:

The following symbols may be useful:  $x$ ,  $y$

Enter the  $y$ -coordinate:

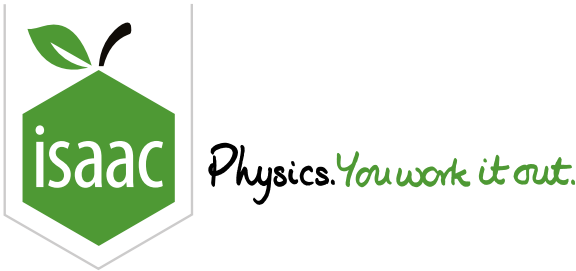
The following symbols may be useful:  $x$ ,  $y$

## Part D Length of $PQ$

Find the length of  $PQ$ .

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# Logarithmic Plots 4

A Level

P

P

P

A student used a graph of  $\ln y$  against  $x$  to discover that  $y = e^{2x+5}$ .

What were the gradient and intercept of the graph?

Part A   Find the gradient

What was the gradient of the graph?

Part B   Find the intercept

What was the intercept of the graph?

Adapted for Isaac Physics from NST IA Biology preparation work

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# Simultaneous Equations 2i

A Level



Solve the simultaneous equations

$$2x^2 + y^2 = 57$$

$$x + 2y - 6 = 0.$$

Enter the pair of  $x$  and  $y$  values that satisfy these equations that has the greatest value of  $x$ .

## Part A Value of $x$

Enter the value of  $x$ .

The following symbols may be useful:  $x$

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## Part B Value of $y$

Enter the value of  $y$

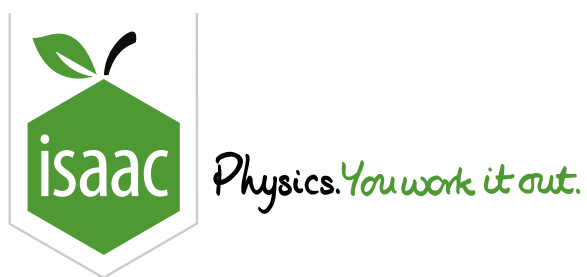
The following symbols may be useful:  $y$

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# Quadratics: Graphs and Discriminants 1i

A Level



## Part A Graph

Sketch the curve  $y = 2x^2 - x - 3$ , giving the coordinates of all points of intersection with the axes.

Enter the value of  $y$  at which the curve crosses the  $y$ -axis.

The following symbols may be useful:  $x$ ,  $y$

**Part B** Solve inequality

Hence or otherwise solve the inequality  $2x^2 - x - 3 < 0$ .

What form does your answer take? Choose from the list below, where  $a$  and  $b$  are constants and  $a < b$ , and then find  $a$  and/or  $b$ .

- ☐  $x < a$
- ☐  $x \leq a$
- ☐  $x > a$
- ☐  $x \geq a$
- ☐  $a < x < b$
- ☐  $a \leq x \leq b$
- ☐  $x < a$  or  $x > b$
- ☐  $x \leq a$  or  $x \geq b$
- 

Write down the value of  $a$ .

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Write down the value of  $b$  (or if your chosen form has no  $b$ , write "n").

The following symbols may be useful: n

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## Part C Possible values

Given that the equation  $2x^2 - x - 3 = k$  has no real roots, find the set of possible values of the constant  $k$ .

Write down an inequality for  $k$ .

The following symbols may be useful:  $<$ ,  $>$ ,  $k$

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# Completing the Square 1ii

A Level

P

P

P

Part A

Complete square

Express  $2x^2 + 12x + 13$  in the form  $a(x + b)^2 + c$ .

The following symbols may be useful:  $x$

Part B

Solve equation

Solve the equation  $2x^2 + 12x + 13 = 0$ , giving your answers in the form  $a \pm b$  where  $a$  and  $b$  are in simplified surd form.

The following symbols may be useful:  $\pm$

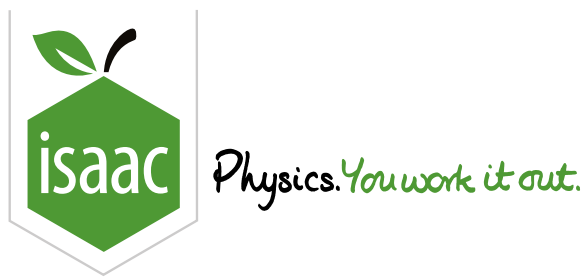
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# Quadratics: Functions of the Unknown 1i



Find the roots of the equation  $x - 8\sqrt{x} + 13 = 0$ , giving your answers in the form  $p \pm q\sqrt{r}$  where  $p$ ,  $q$ , and  $r$  are integers.

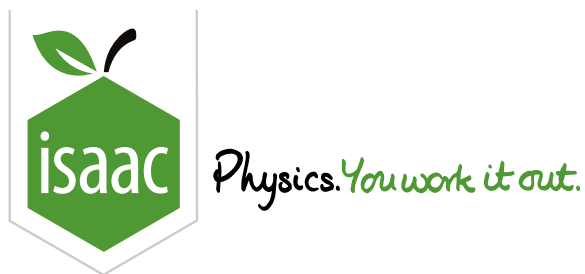
The following symbols may be useful:  $\pm$

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# 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:  $y$

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## 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 ( $\log_3$ ).

When you are entering your answer, note that  $\log_a b$  can be written using  $\log(b, a)$ .

The following symbols may be useful:  $\log()$ ,  $\times$

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# Solving Equations & Logs 2i

A Level



## Part A Solve equation

Use logarithms to solve the equation  $2^{n-3} = 18000$ , giving your answer to 3 significant figures.

---

## Part B Simultaneous equations

Solve the simultaneous equations  $\log_2 x + \log_2 y = 8$  and  $\log_2\left(\frac{x^2}{y}\right) = 7$

State the value of  $x$ .

The following symbols may be useful:  $x$

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State the value of  $y$ .

The following symbols may be useful:  $y$

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