Edexcel B (R)

Functions

2022 International GCSE Advance Information

Sparx Topics & Key Questions

We are always looking for ways to support maths teachers and students. In order to help you and your year 11s this year we've pulled together a list of key questions which may be useful to practise with your students based on the exam board topic lists.

These 38 key questions are all taken from our library of over 45,000 high-quality questions in Sparx Maths. If you are a Sparx Maths School then your students can use the Topic Codes provided to search the full content library directly within the independent learning section of Sparx Maths to help target their revision.

Please note this is not an exhaustive topic guide it is simply designed to help you pull together some key questions to use to check for understanding in lessons, starters, or as worksheets with your learners.

Functions	Topics	Sparx Topic Codes
Function language and notation	Composition and inverse of functions	B136, B570
Proportion	Direct proportion	B903
	Inverse proportion	B419
Graphs	Equation of a straight line	B815, B116, B254, B687
	Plot and draw graphs	B210, B754, B211, B368, B381, B811
	Solve equations graphically	B989, B323
Calculus	Differentiation	B130, B292
	Stationary points	B638
	Kinematics	B817

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Function language and notation - Composition and inverse of functions

Finding composite functions B136

The functions g and h are shown below.

$$g(x) = 2x + 7$$
$$h(x) = x^2 - 10$$

Work out $hg(x)$.
Give your answer in its simplest form and expand any brackets.

Finding inverse functions B570

The function g is shown below.

$$g(x) = \frac{x-10}{3}$$

Work out an expression for $g^{-1}(x)$.
Expand any brackets in your answer.

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Proportion - Direct proportion

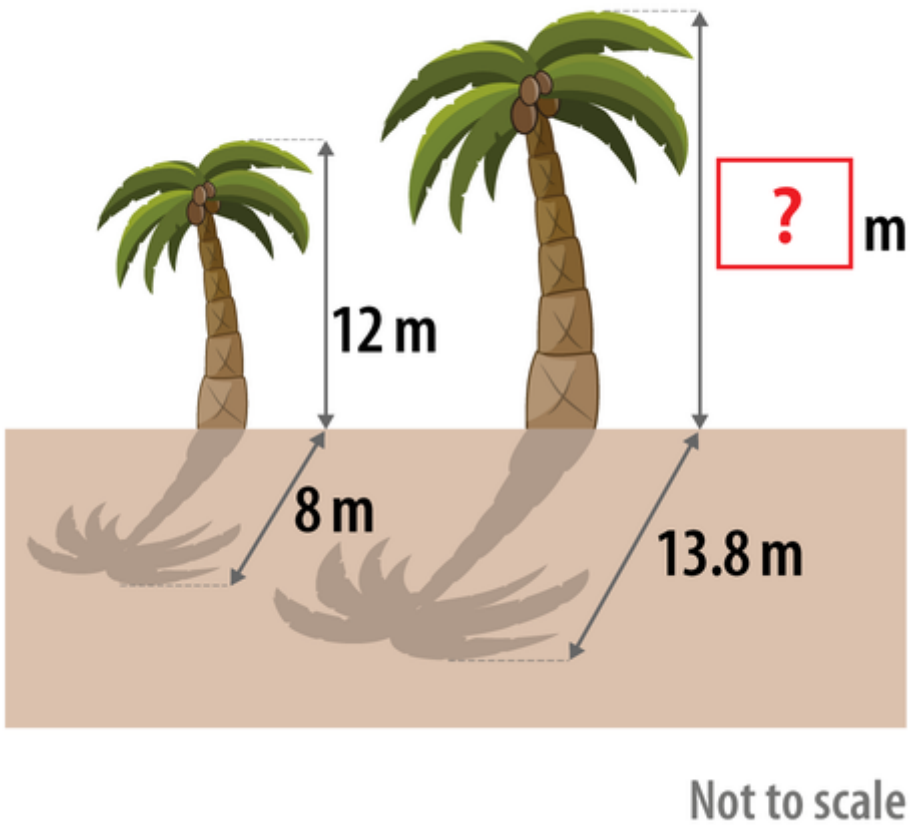
Constructing direct proportion equations B903

Peter measures the heights of two trees and the lengths of their shadows. He notices that the height of each tree and the length of its shadow are **directly proportional**.

One of the trees has a height of 12 m and an 8 m long shadow.

The other tree has a 13.8 m long shadow. Calculate its height, in metres (m).

Give any decimal answers to 1 d.p.



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$$f \propto p^2$$

Given that $f = 90$ when $p = 5$, work out the value of f when $p = 3$

Give any decimal answers to 1 d.p.

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Proportion - Inverse proportion

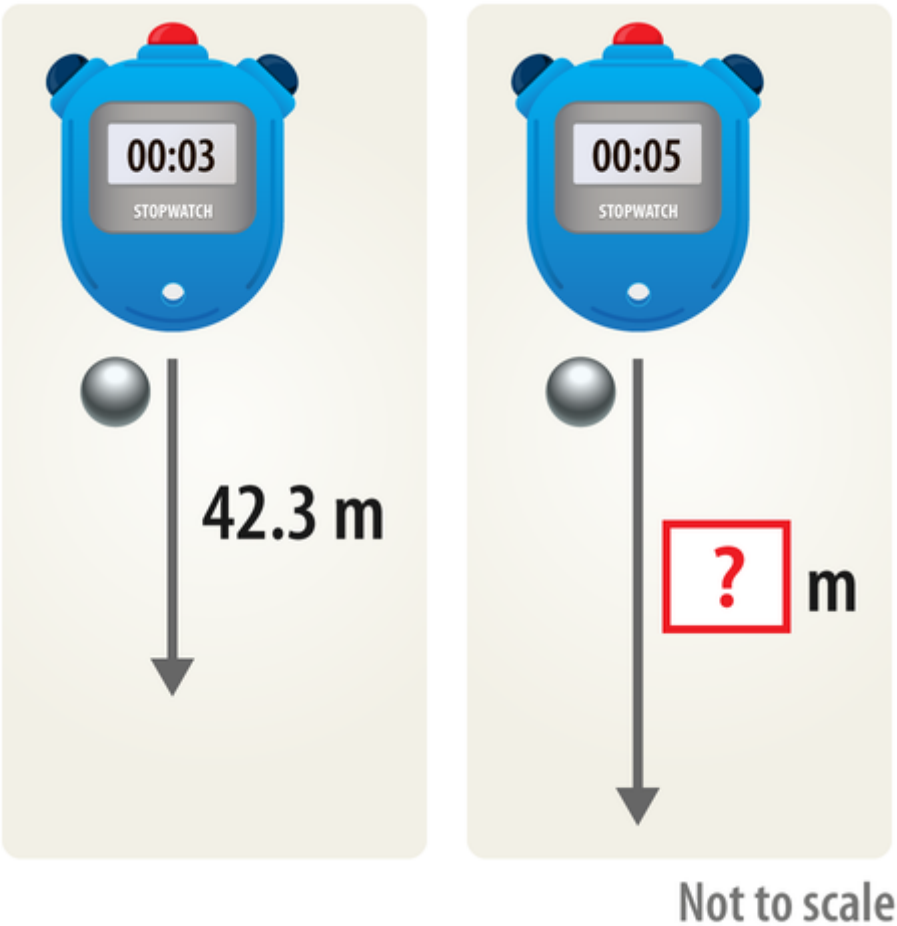
Constructing inverse proportion equations B419

When a marble is dropped it falls d metres in t seconds.

d is **directly proportional** to t^2

It takes 3 seconds for the marble to fall 42.3 metres. How far, in metres, would it fall in 5 seconds?

Give any decimal answers to 1 d.p.



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A radiation counter records n counts when it is placed d metres from a radiation source.

n is **inversely proportional** to d^2

$n = 5$ when $d = 12$

What is the value of n when $d = 3$?

Give any decimal answers to 1 d.p.

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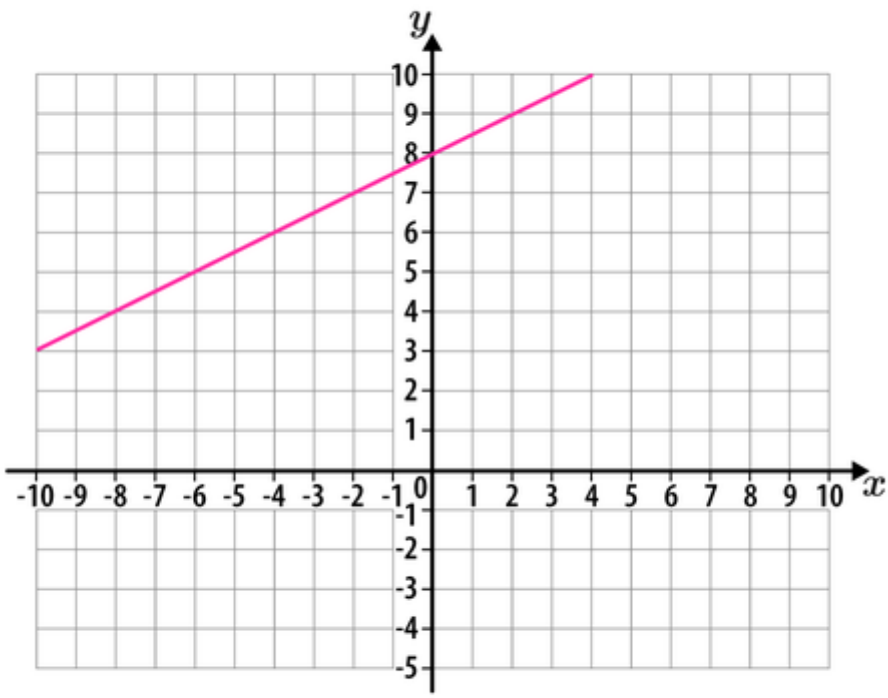
Graphs - Equation of a straight line

Finding equations of straight line graphs B815

What is the equation of the straight line shown below?

Give your answer in the form $y = mx + c$, where m and c are integers or fractions in their simplest forms.



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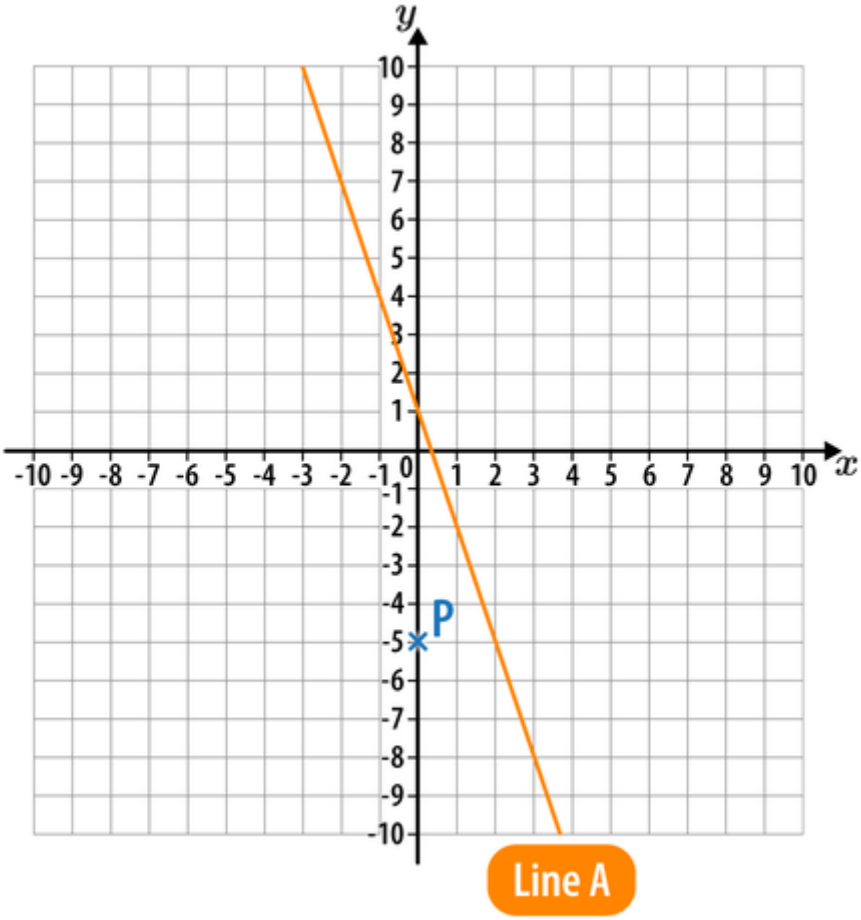
The graph below shows line A and point P.

Line B is the straight line that is parallel to line A and passes through point P.

Work out the equation of line B.
Give your answer in the form $y = mx + c$, where m and c are integers or fractions in their simplest forms.



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Interpreting equations of straight line graphs B116

A line has the equation $2y = 9x - 5$

a) What is the gradient of the line?
b) What is the y-intercept of the line?

Give each answer as an integer or as a fraction in its simplest form.

Which one of the equations below gives a line that is parallel to the line given by $y - 4x = 12$?

$y = 4x - 9$

$y = 12x + 4$

$y = 12 - 4x$

$y = \frac{1}{4}x + 12$

$y = 9 - \frac{1}{4}x$

Finding the equation of a straight line from its gradient and a point B254

Line A passes through the point $(8, -4)$ and is parallel to the line given by $2x + 4y = 1 + 7x$.

Work out the equation of line A.

Give your answer in the form $y = mx + c$, where m and c are integers or fractions in their simplest forms.

Finding the equation of a straight line from two points on the line **B687**

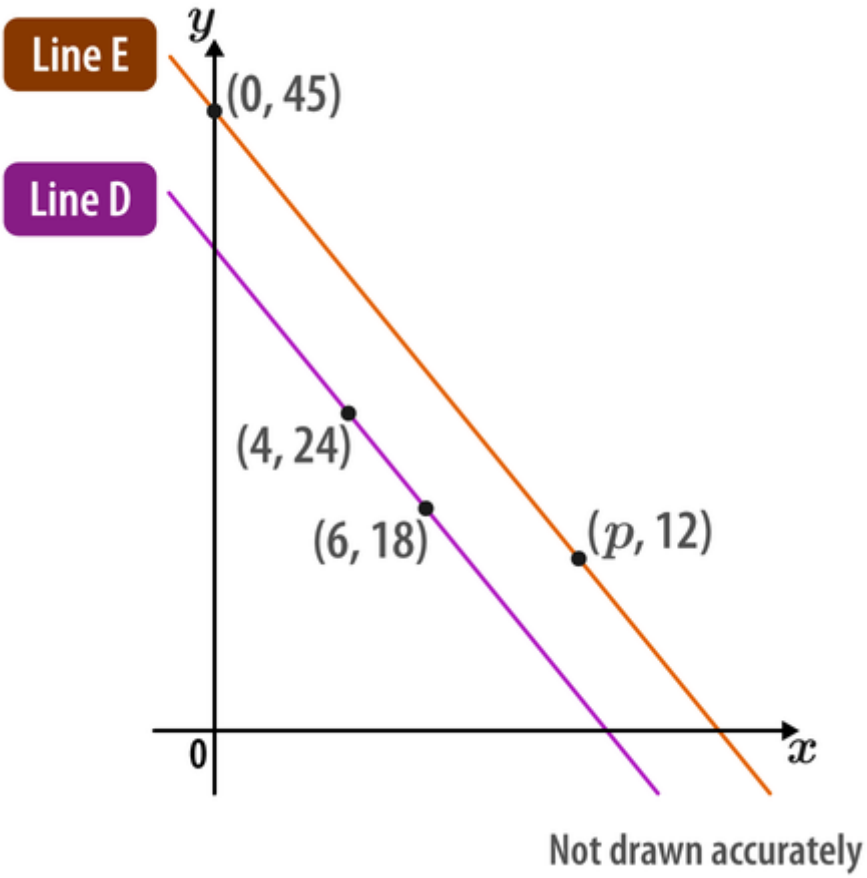
The straight line that passes through the points $(4, w)$ and $(8, 1)$ has gradient $\frac{3}{5}$.

What is the value of w?

Give your answer as an integer or as a fraction in its simplest form.

The graph below shows two parallel lines, D and E.

Work out the value of p.
If your answer is a decimal, give it to 1 d.p.



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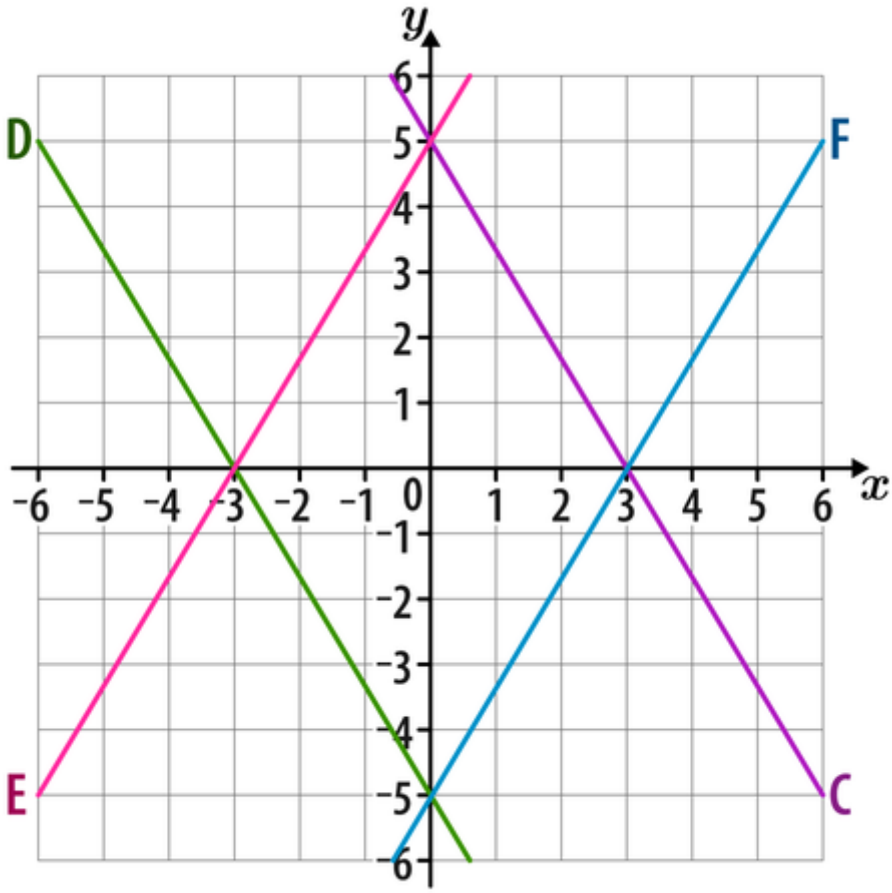
Graphs - Plot and draw graphs

Plotting straight line graphs B210

Create a table of values for the graph of $3x + 2y = 6$ where the values of x are from -1 to 3.

a) The coordinates $(0, \mathrm{A})$ and $(\mathrm{B}, 0)$ lie on the line $5x - 3y = 15$.
What are the values of A and B?

b) Use your answer to part a) to work out which line below is $5x - 3y = 15$.



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Plotting linear real-life graphs **B754**

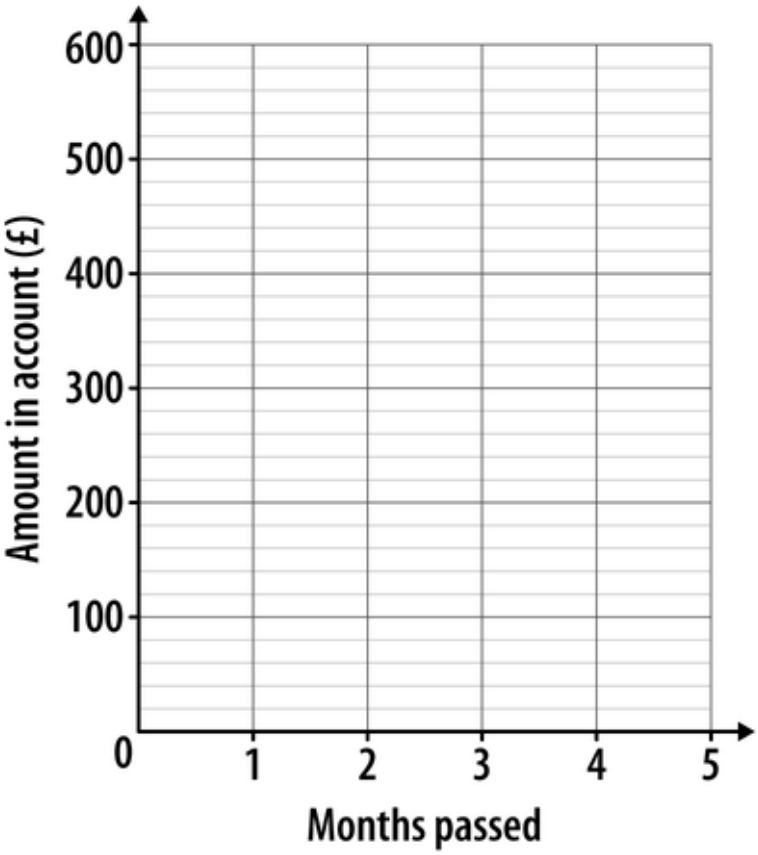
A bank account contains £500.

£80 is withdrawn from the account during each month.

a) Copy and complete the table of values below.
What values replace A, B, C and D?

Months passed	0	1	2	3
Amount in account (£)	A	B	C	D

b) Plot this relationship on a copy of the axes below.



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The cost of hiring a canoe is £6 up front, then £10 for each day that it is hired for.

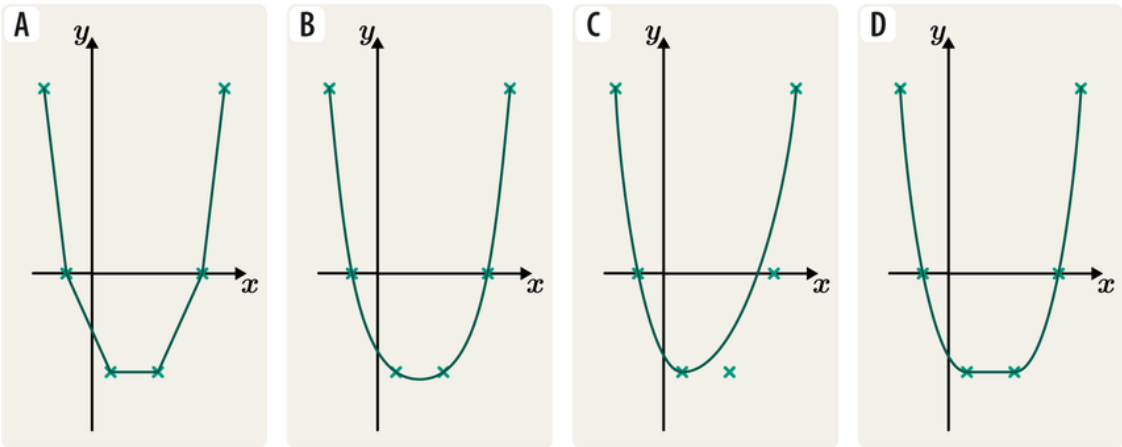
a) Write an equation for the cost of hiring a canoe in pounds, c, in terms of the number of days it is hired for, d.

b) Use your equation to complete the table of values.
Work out the values that replace A, B and C.

Days hired	1	2	3
Cost (£)	A	B	C

Plotting graphs of quadratic functions **B211**

Which of these options shows a correctly drawn quadratic graph?



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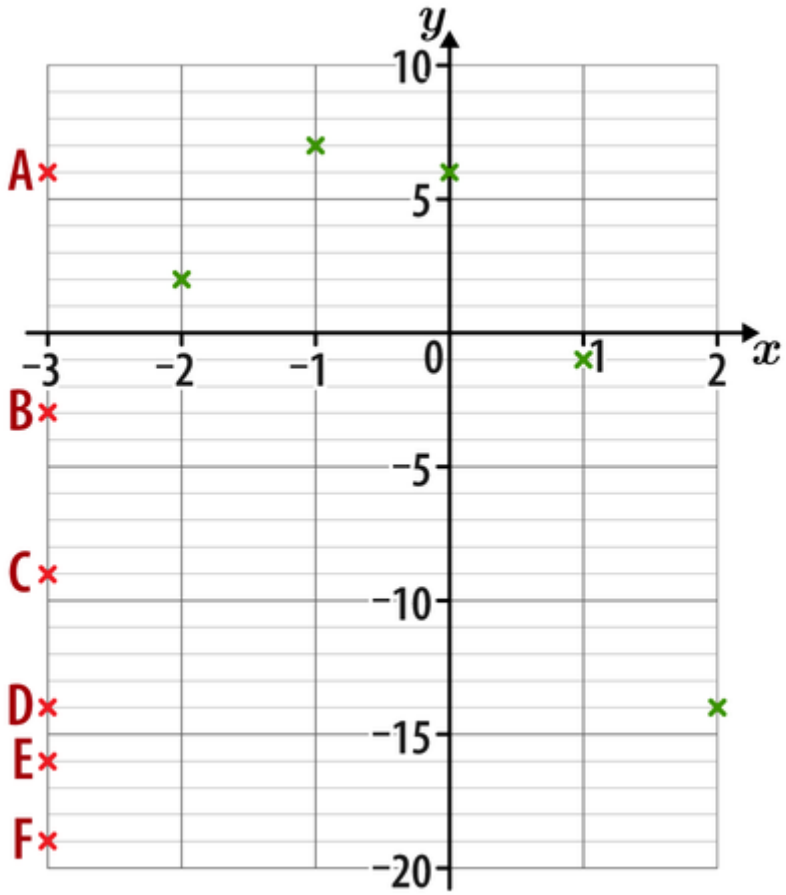
Which of the points A-F is on the curve $y = -3x^2 - 4x + 6$?



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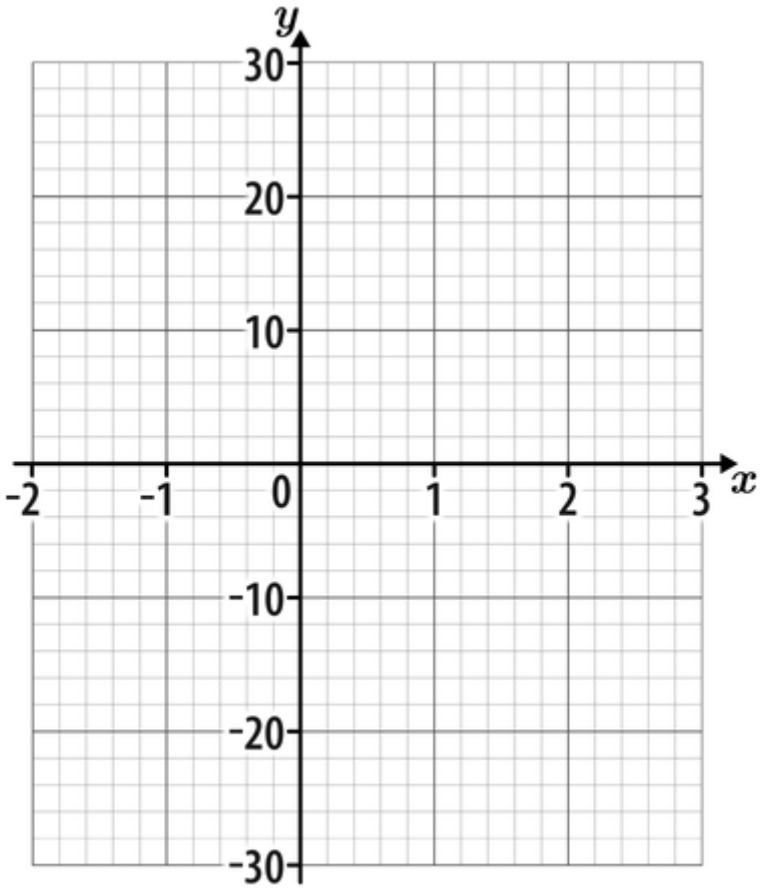
Graphs of cubic functions **B368**

Copy the axes below.

By first completing the table, draw the graph of $y = 2x^3 - 3x^2 - x + 2$ on your axes.

x	-2	-1	0	1	2	3
y	-24				4	



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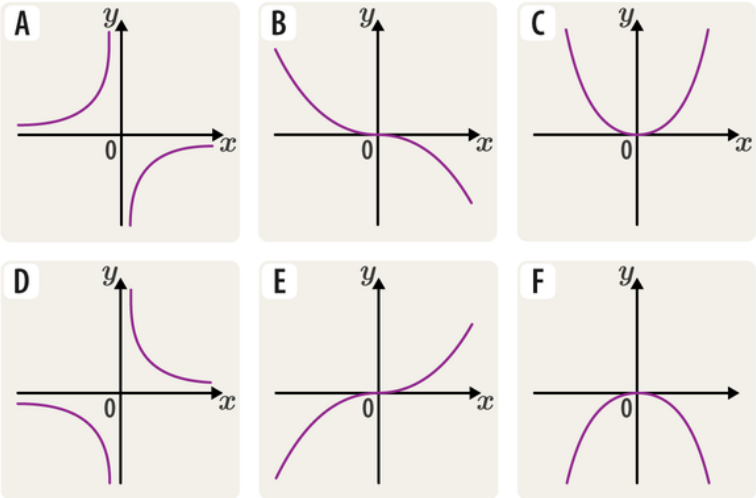
Which of these could be the graph of $y = -x^3 - 3x$?

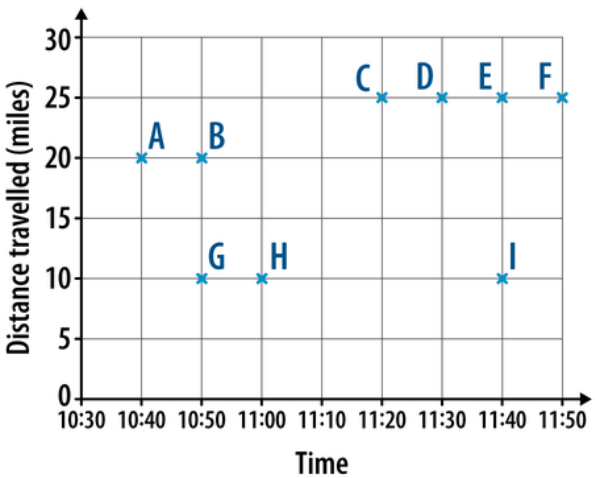


Plotting distance-time graphs using speeds **B381**

Tyler sets off at 10:30 to travel to his friend`s house, which is 25 miles away.

He travelled the first 10 miles of his journey at a constant speed in 20 minutes.
He travelled the rest of the way at a constant speed in 50 minutes.

Select **all** of the points A-I that lie on the distance-time graph for Tyler`s journey



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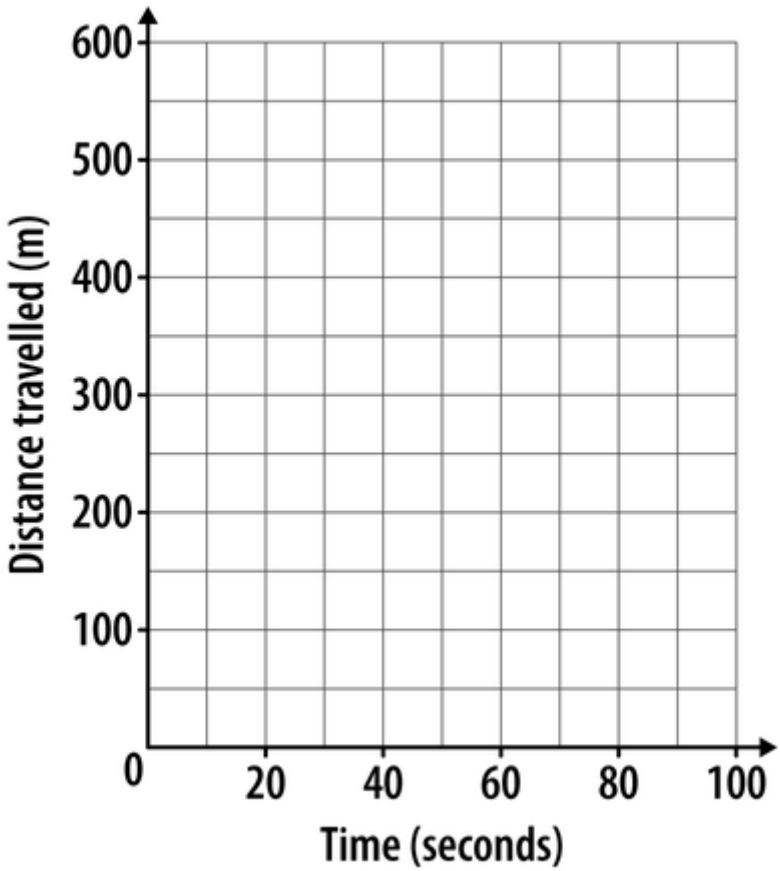
Archie ran a $400\ \mathrm{m}$ race.

For the first $20\ \mathrm{seconds}$ of the race he ran at a constant speed of $7.5\ \mathrm{m/s}$.
He ran the rest of the race at a constant speed of $5\ \mathrm{m/s}$.

Copy the axes below and draw the distance-time graph of Archie`s race.



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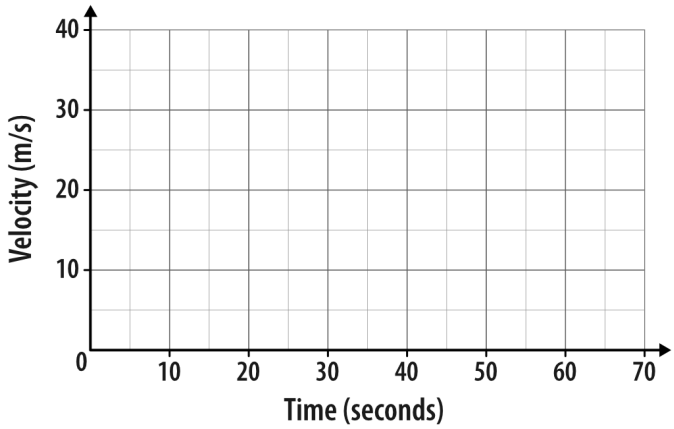
Plotting velocity-time graphs **B811**

A train starts from rest and travels with a constant acceleration of $0.5\ \mathrm{m/s^2}$ for 10 seconds.

It then travels with a constant acceleration of $1.4\ \mathrm{m/s^2}$ to reach a velocity of $40\ \mathrm{m/s}$.

Copy the axes below and plot the velocity-time graph for the train`s journey.



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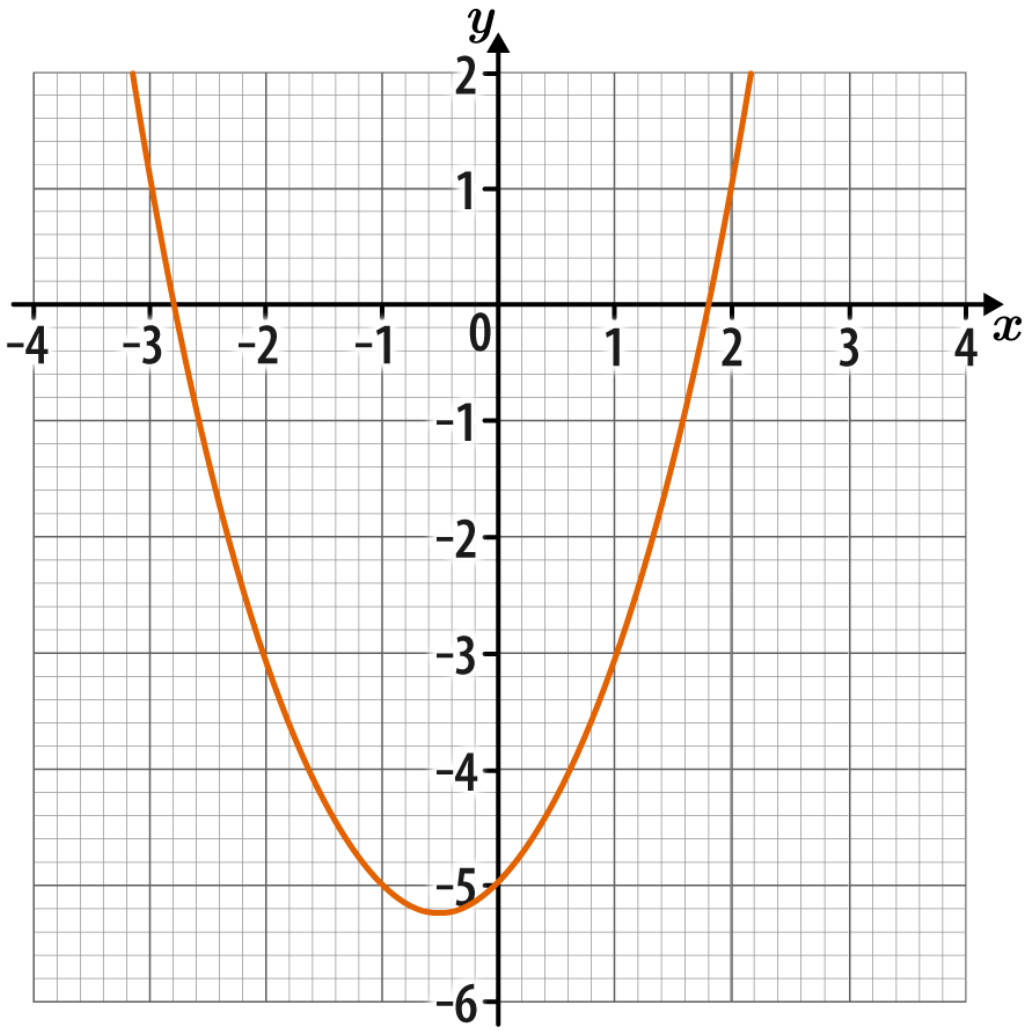
Graphs - Solve equations graphically

Solving quadratic equations graphically B989

Here is the graph of the function $y = x^2 + x - 5$.
Estimate the solutions to $x^2 + x - 5 = 0$.

Give your answers to 1 decimal place.



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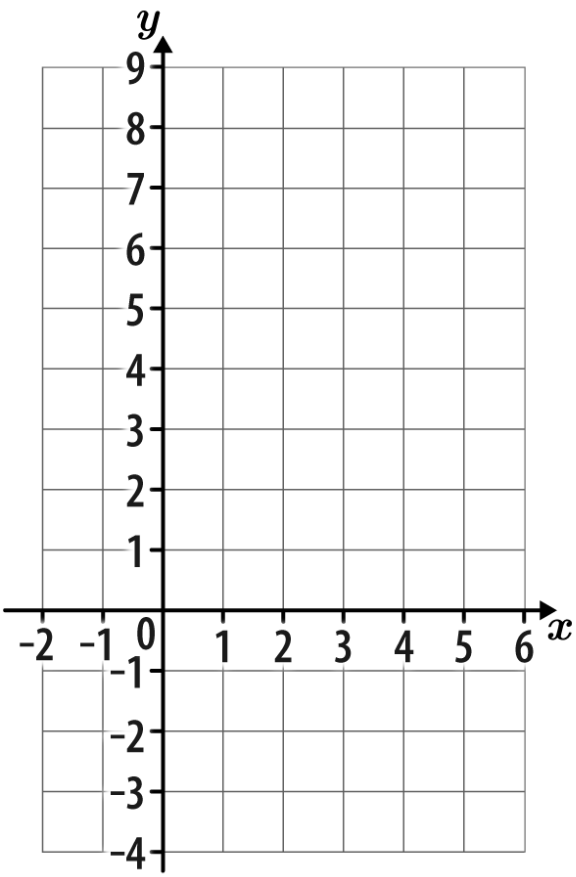
Copy and complete the table of values for $y = x^2 - 5x + 3$.

x	-1	0	1	2	3	4	5	6
y	9	3						

Copy these axes onto graph paper and use your completed table to help you plot the graph of $y = x^2 - 5x + 3$.

Then, by adding the line $y = 3$ to your diagram, solve the equation $x^2 - 5x + 3 = 3$.



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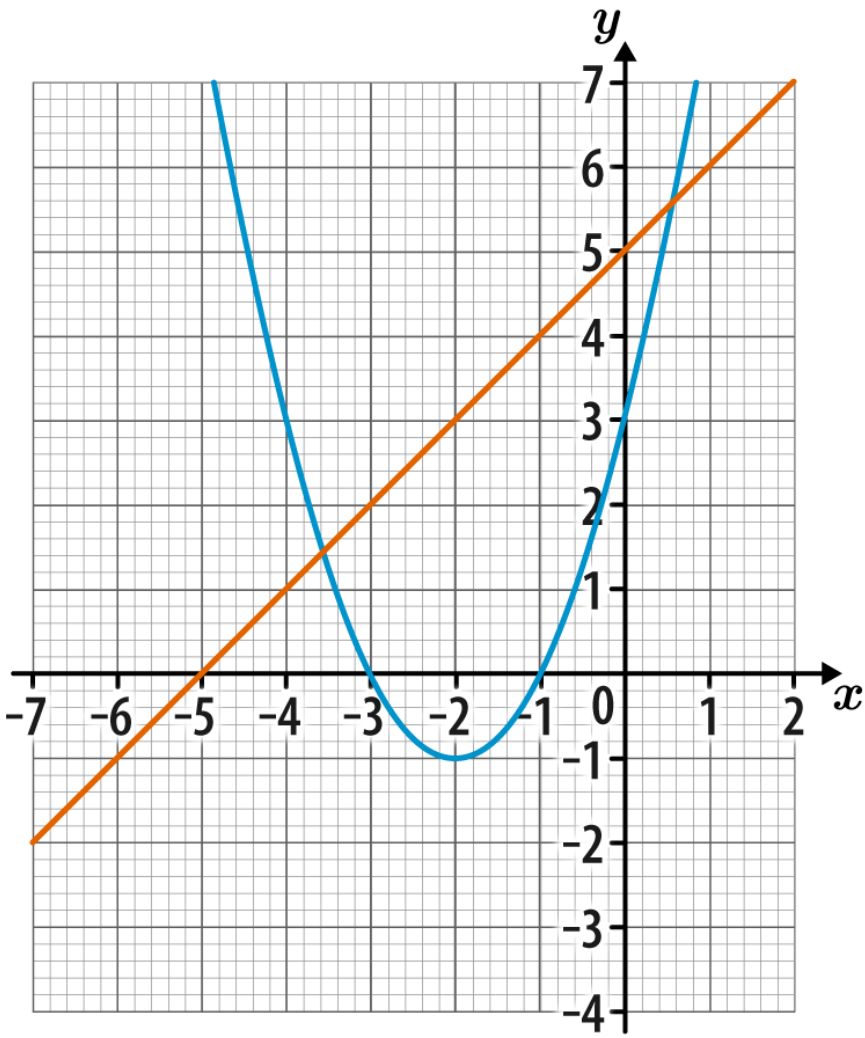
The diagram shows the graph of $y = x^2 + 4x + 3$ and the line $y = x + 5$.

Use the graph to estimate the solutions to $x^2 + 4x + 3 = x + 5$ graphically.
Give your answers to 1 decimal place.



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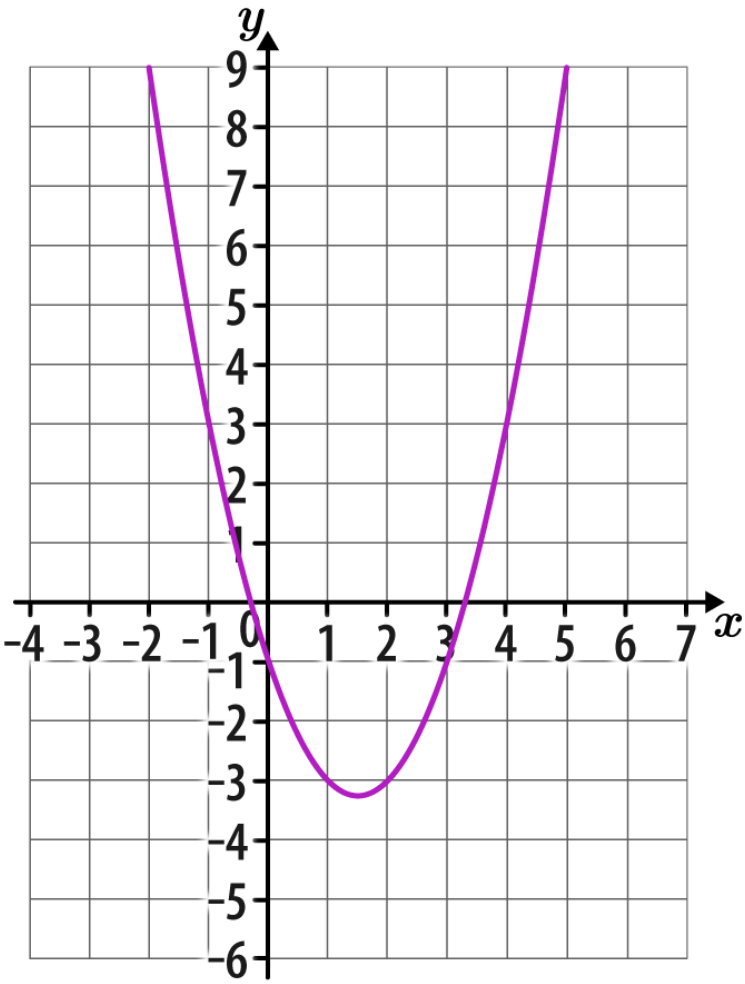
The diagram below shows the graph of $y = x^2 - 3x - 1$.

What line should you add to the graph in order to solve the equation $x^2 - 5x + 2 = 0$?

Give your answer in the form $y = mx + c$.



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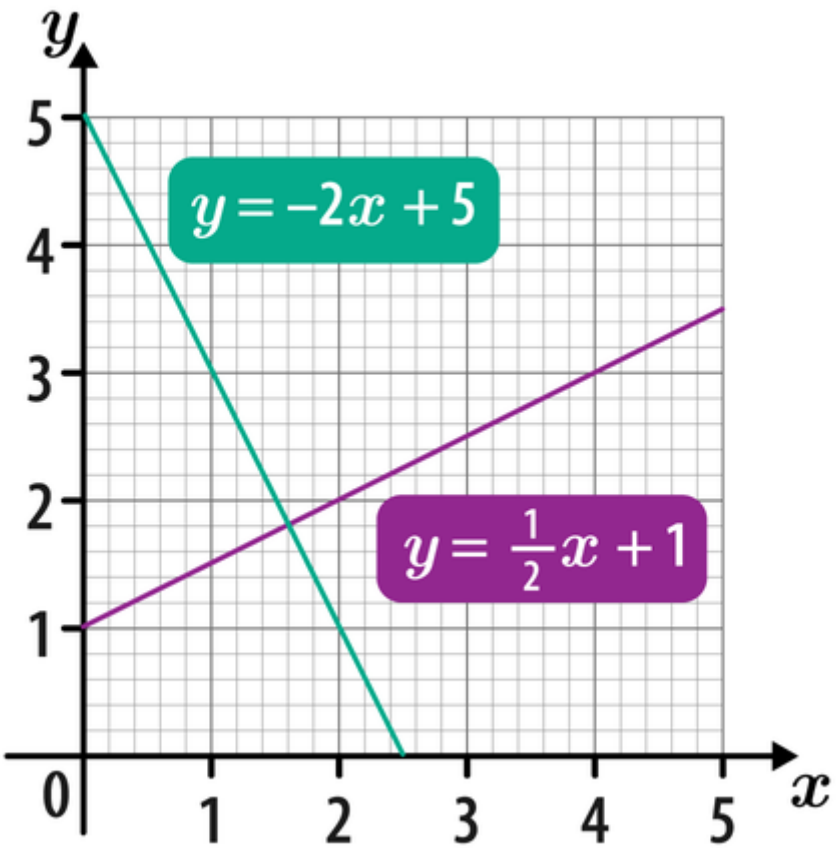
Solving simultaneous equations graphically **B323**

Use the diagram to work out the solution to these simultaneous equations:

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



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Copy the axes below.

a) By completing the tables of values to help you, plot the lines $y = \frac{1}{4}x + 5$ and $y = -2x + \frac{1}{2}$ on your axes.

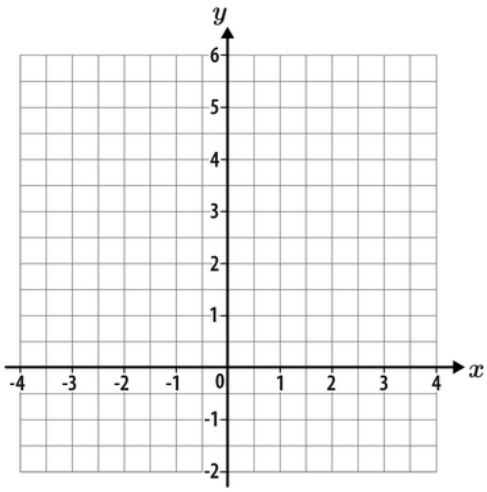
b) Use your diagram to find the solution to the simultaneous equations $y = \frac{1}{4}x + 5$ and $y = -2x + \frac{1}{2}$.

$y = \frac{1}{4}x + 5$

x	-4	0	4
y			

$y = -2x + \frac{1}{2}$

x	-1	0	1
y			



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Calculus - Differentiation

Differentiating functions B130

$$x = \frac{1}{6}w^3 - 8w$$

a) Find a value of w such that $\frac{\mathrm{d}x}{\mathrm{d}w} = 42$.

b) Use your answer to part a) to find a value for x when $\frac{\mathrm{d}x}{\mathrm{d}w} = 42$.

Give any decimal answers to 1 d.p.

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ when

a) $y = \frac{3}{x}$

b) $y = \frac{1}{6x^2}$

$$y = \frac{7x^5 - 3x^7}{2x}$$

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$

Give your answer in its simplest form.

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Using differentiation to find gradients **B292**

A curve has the equation $y = \frac{5}{2}x^4 + 148$.

Find the equation of the tangent to the curve at the point $(2, 188)$.
Give your answer in the form $y = mx + c$.

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Calculus - Stationary points

Finding and classifying stationary points B638

A curve has the equation $y = 2x^3 - 9x^2 - 12$.

Find the coordinates of the two stationary points of this curve, and state which point is a maximum and which is a minimum.

Give any decimals in your answer to 1 d.p.

The curve $y = x^3 + ax + b$ has a stationary point at $(1, 13)$.

Work out the values of a and b, giving any decimals to 1 d.p.

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Calculus - Kinematics

Using differentiation to solve problems B817

The displacement, s metres, of an object is described by the equation
$s = 2t^3 - 12t^2 + 30t$, where t is the time in minutes and $t \geq 0$.

Find the time at which the object has the smallest velocity.
If your answer is a decimal, give it to 1 d.p.

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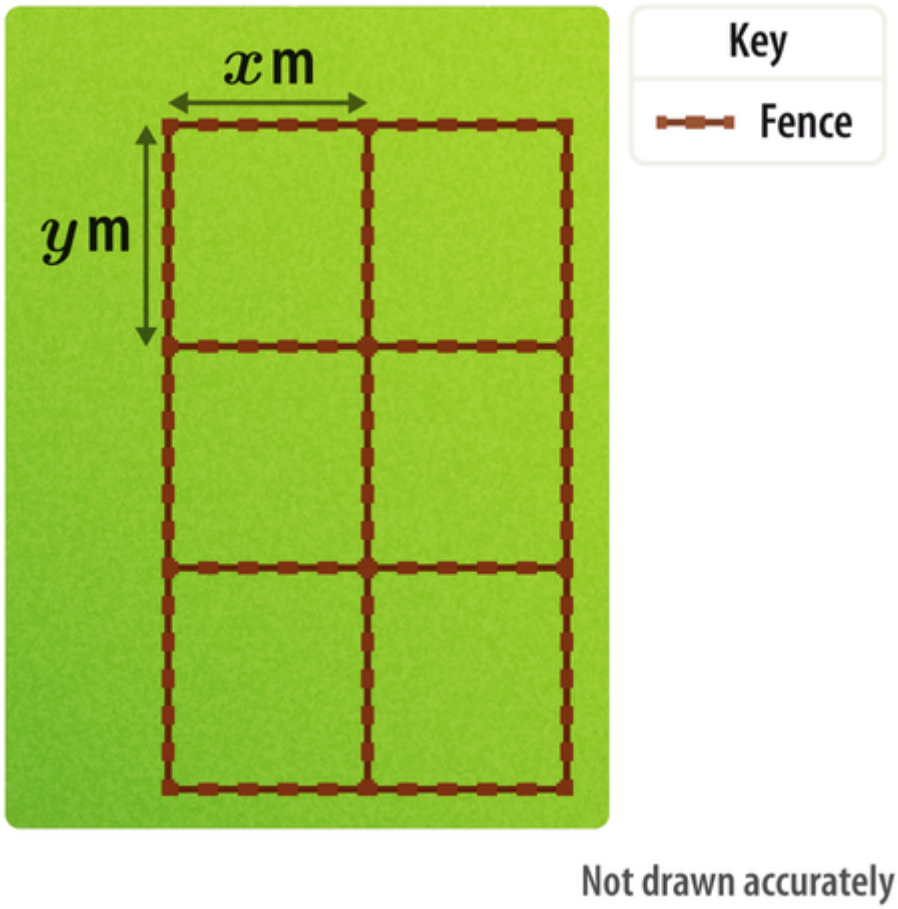
The owner of a petting zoo wants to create a rectangular enclosure and divide it into 6 identical rectangular pens, as shown below. She uses $1080\ \mathrm{m}$ of fence.

a) Show that $y = 120 - \frac{8}{9}x$, and use this to show that the total area, in m^2, enclosed by the pens is $720x - \frac{16}{3}x^2$.

b) Find the values of x and y that maximise this area.
Give any decimal answers to 1 d.p.



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