Test yourself

14 January 2019 12:14

PROJECT MATHS

Text & Tests

Leaving 3 Certificate

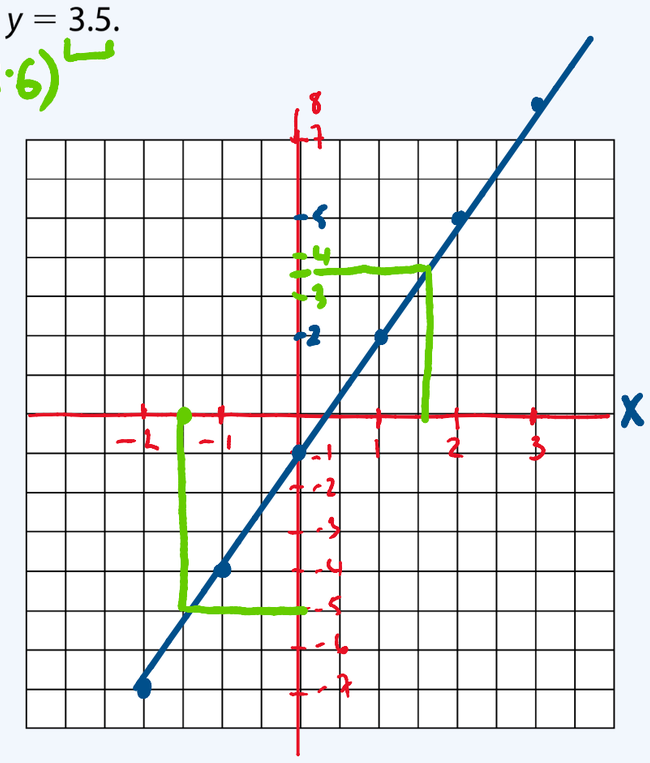
chapter 17

Graphing Functions

Test Yourself 17

Test yourself 17

1. (a) Draw the graph of the function $f(x) = 3x - 1$ in the domain $-2 \leqslant x \leqslant 3$.
Use your graph to estimate
(i) $f(-1.5)$ (ii) the value of x when $y = 3.5$.



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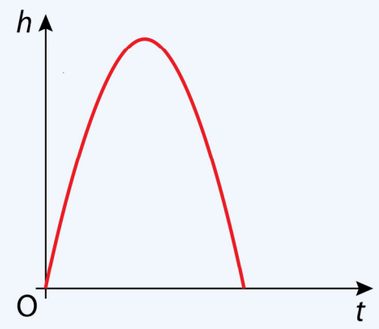
(b) The diagram on the right shows the path of a rocket which is fired into the air.
The height, h metres, of the rocket, after t seconds, is given by $h = 30t - t^2$.

(i) For how many seconds is the rocket in flight?
(ii) What is the maximum height reached by the rocket?



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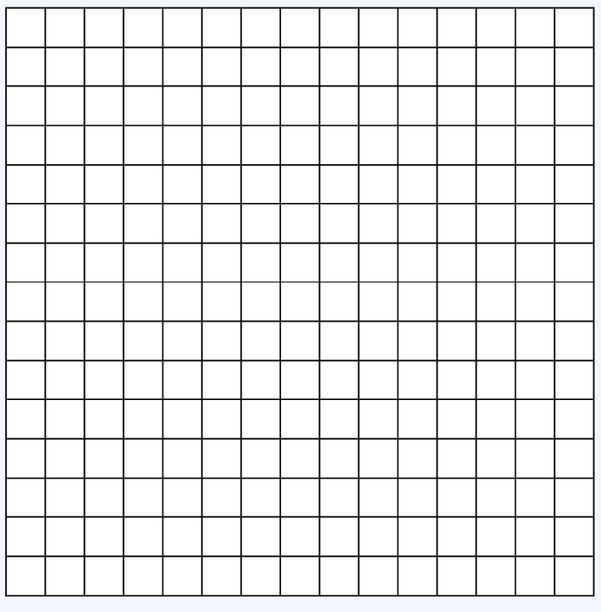
(c) If $f(x) = x^3 - 2x^2 - 5x + 4$, copy and complete the following table:

x =	−2	−1	0	1	2	3	3.5
$f(x)$ =	−2					−2	4.9

Draw the graph of the function $f(x) = x^3 - 2x^2 - 5x + 4$ in the domain $-2 \leqslant x \leqslant 3.5$.

Use your graph to estimate
(i) the roots of the equation $f(x) = 0$
(ii) the values of x at which $f(x) < 0$ and $(x) > 0$
(iii) the coordinates of the minimum turning point
(iv) the values of x at which $f(x)$ is negative and decreasing
(v) the roots of the equation $y = 4$
(vi) the value of $f(-1.5)$.



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2. (a) On the right is the graph of the function $f(x) = x^2 - 4x$.

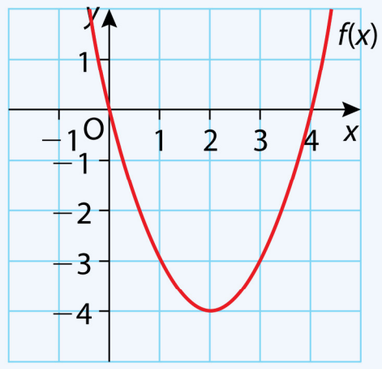
Use the curve to write down

(i) $f(3.5)$

(ii) the values of x for which $f(x) = -3$

(iii) the minimum value of $f(x)$

(iv) the equation of the axis of symmetry of the curve.



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(b) Match each of the graphs on the next page with one of the equations given.

$y = kx$ $\quad$ $y = x^2 - k$ $\quad$ $y = k - x^2$ $\quad$ $y = k - x$

In each equation, k is a positive number.
(One of the equations is not needed.)

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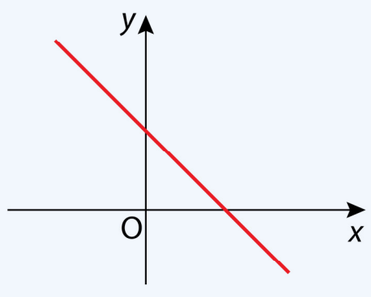

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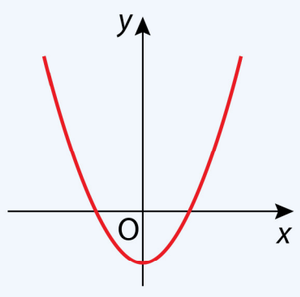

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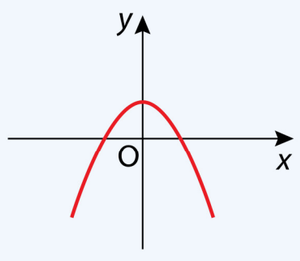

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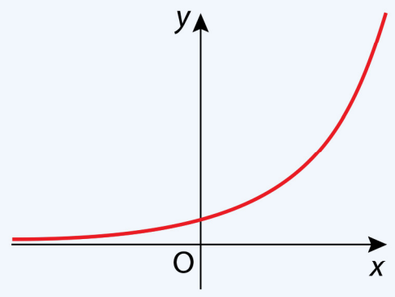
(c) The diagram shows a sketch of the curve $y = 3^x$.



(i) Write down the coordinates of the point where the curve cuts the y-axis.

(ii) Copy the diagram and add sketches of the curves

(a) 2×3^x (b) 5×3^x.

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3. (a) A straight line is represented by the equation $y = ax + b$.
Sketch a possible straight line graph to illustrate this equation when $a = 0$ and $b > 0$.

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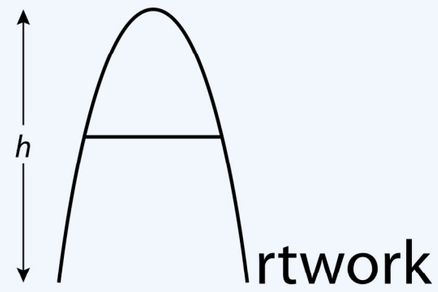
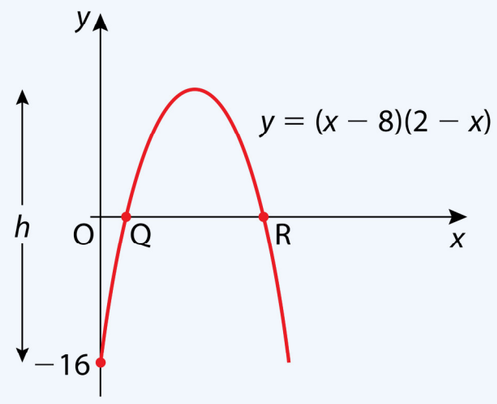
(b) The curved part of the letter A in the *Artwork* logo is in the shape of a parabola.

The equation of this parabola is $y = (x - 8)(2 - x)$.





(i) Write down the coordinates of Q and R.

(ii) Calculate the height, h, of the letter A.

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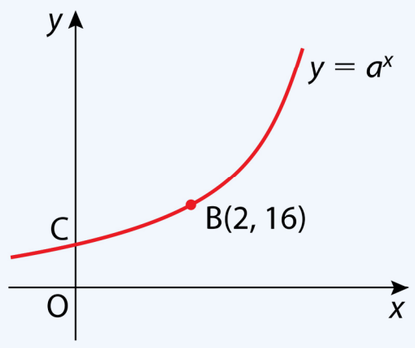
(c) Part of the graph of $y = a^x$, where $a > 0$, is shown.

The graph cuts the y-axis at C.

(i) Write down the coordinates of C.

B is the point (2, 16).

(ii) Calculate the value of a.



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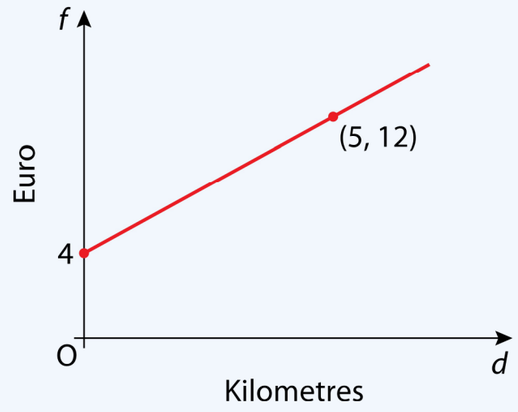
4. (a) A taxi fare consists of a €4 "callout" charge **plus** a fixed amount per kilometre.
The graph shows the fare, f euro, for a journey of d kilometres.
The taxi fare for a 5 km journey is €12.
Find the equation of the straight line in terms of d and f.
Use the equation to find the cost of a journey of 20 km.



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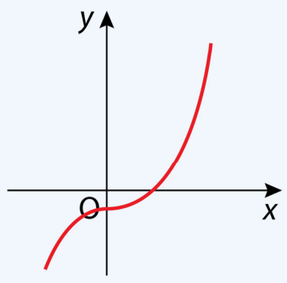
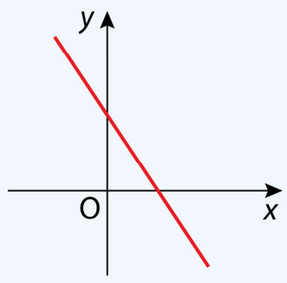
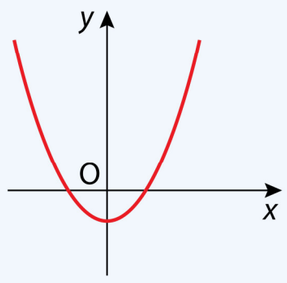
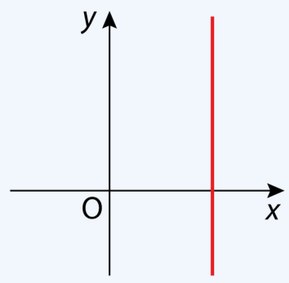
(b) Match the graphs below with their equations.
For the equation that is left over, sketch its graph.

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

$x = 4$

$y = x^2 - x - 6$

$y = 5$

$y = x^3 - 1$

$y = 3 - 2x$

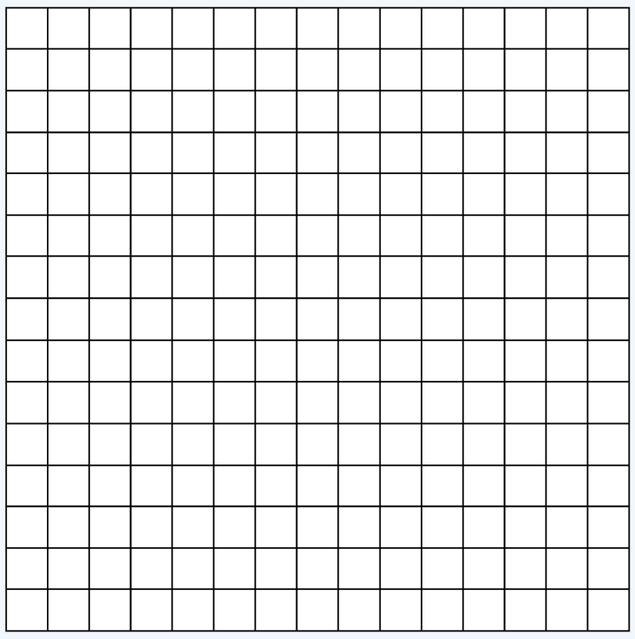
Test yourself 17

(c) Copy and complete the following table.

x	−3	−2	−1	0	1	2	3	4	5
2^x	0.125			1		4			

(i) Use the values in your table to draw the graph of $y = 2^x$ using a scale of 1 cm for 1 unit on the x-axis, and 1 cm for 5 units on the y-axis.

(ii) Use your graph to solve the equation $2^x = 5$.



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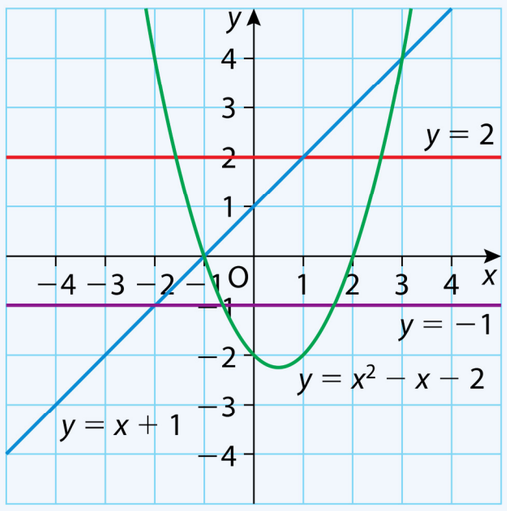
5. (a) Some graphs are drawn on the right.
Use these graphs to find the approximate solutions of these equations:

(i) $x^2 - x - 2 = 2$

(ii) $x^2 - x - 2 = -1$

(iii) $x^2 - x - 2 = x + 1$



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(b) The profit made by the publishing company of a magazine is calculated by the formula

$$y = 4x(140 - x),$$

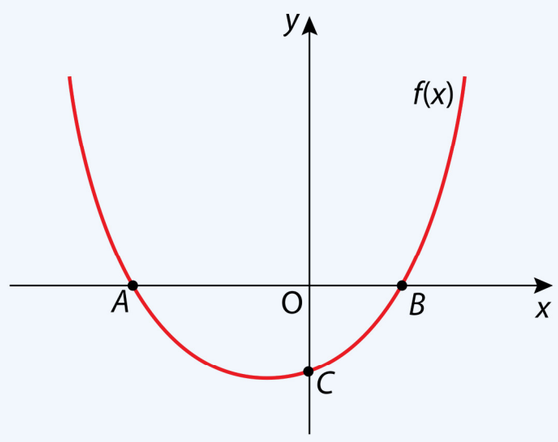
where y is the profit (in euro) and x is the selling price of the magazine (in euro).
The graph on the right represents the profit y against the selling price x.
Find the maximum profit the company can make from the sale of the magazine.

Test yourself 17

(c) The curve on the right is the graph of the function

$$f(x) = x^2 - 2x - 3.$$

(i) Find the coordinates of A, B and C.
(ii) Write down the values of x for which $f(x) \leqslant 0$.
(iii) If $f(k) = -3$, find two values for k.



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6. (a) The following table gives the cost of hiring a surfboard for a number of days:

Days *t*	3	4	5	6
Cost €C	50	60	70	80

(i) By using any two couples, write down the equation of the line that relates the cost €C to the number of days t.

(ii) Use the equation to find the cost of hiring a surfboard for two weeks.

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(b) Which sketch graph fits which equation?
Give reasons for your answers.

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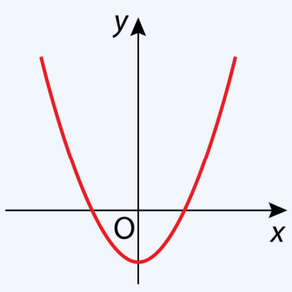

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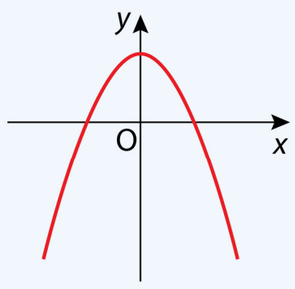

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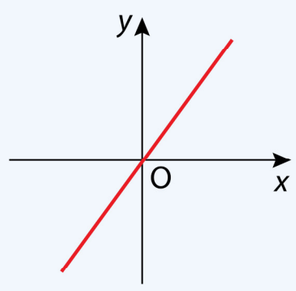

$y = 2x$

$y = x^2 - 2$

$y = 2 - x^2$

$y = x^2 + 2$

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(c) Draw a graph of the function $f(x) = x^3 - 5x + 1$ in the domain $-3 \leqslant x \leqslant 3$.
Use your graph to estimate

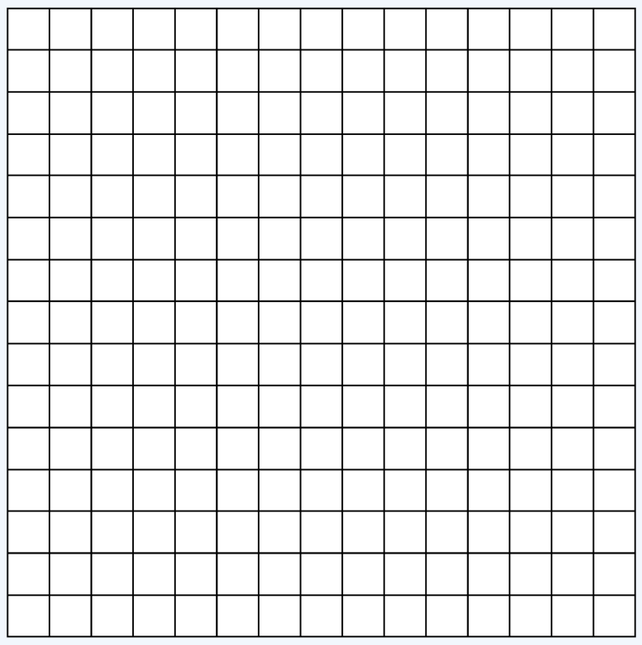
(i) the roots of the equation $f(x) = 0$

(ii) the values of x for which $f(x) > 0$ when $x < 0$

(iii) $f(-2.5)$

(iv) the roots of the equation $f(x) = 1$.

Explain algebraically why one of the roots you have found in (iv) gives an approximate value for $\sqrt{5}$.



Answers Test yourself 17

1. (a) (i) -5.5 (ii) 1.5
(b) (i) 30 sec (ii) 225 m
(c) $(-1, 6)$, $(0, 4)$, $(1, -4)$, $(2, -6)$;
(i) -1.85, 0.7, 3.2 (ii) $0.7 < x < 3.2$
(iii) $(2, -6)$ (iv) $0.7 < x < 2$
(v) -1.4, 0, 3.4 (vi) 3.6

2. (a) (i) -1.75 (ii) $x = 1, 3$
(iii) -4 (iv) $x = 2$
(b) $A: y = k - x$; $B: y = x^2 - k$; $C: y = k - x^2$
(c) (i) (0, 1)

3. (b) (i) $Q(2, 0)$; $R(8, 0)$ (ii) $h = 25$
(c) (i) (0, 1) (ii) $a = 4$

4. (a) $5f = 8d + 20$; €36
(b) $A: y = x^3 - 1$; $B: y = 3 - 2x$;
$C: x^2 - x - 6$; $D: x = 4$
(c) $(-3, 0.125)$, $(-2, 0.25)$, $(-1, 0.5)$, (0.1), (1, 2), (2, 4), (3, 8), (4, 16), (5, 32)
(ii) 2.3

5. (a) (i) -1.6, 2.6 (ii) -0.6, 1.6
(iii) -1, 3
(b) €19 600
(c) (i) $A = (-1, 0)$, $B = (3, 0)$, $C = (0, -3)$
(ii) $-1 \leqslant x \leqslant 3$
(iii) $k = 0, 2$

6. (a) (i) $€C = 10t + 20$
(ii) €160
(b) $A: y = x^2 - 2$; $B: y = 2 - x^2$; $C: y = 2x$
(c) (i) -2.3, 0.2, 2.1 (ii) $-2.3 < x < 0$
(iii) -2.1 (iv) -2.25, 0, 2.25
(v) $x^3 - 5x + 1 = 1 \Rightarrow x^3 - 5x = 0 \Rightarrow$
$x(x^2 - 5) = 0 \Rightarrow x = 0$ or $x = \pm\sqrt{5}$