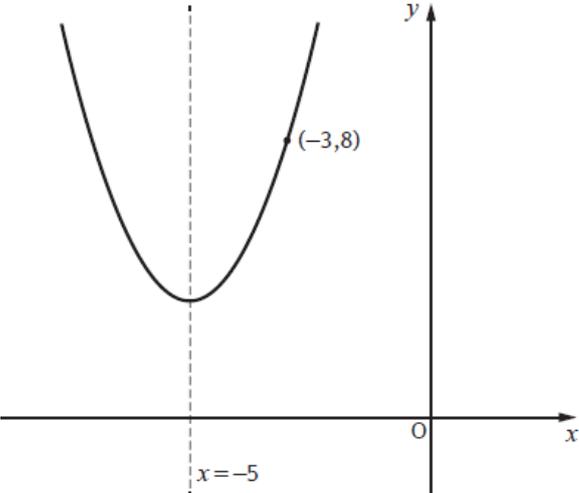
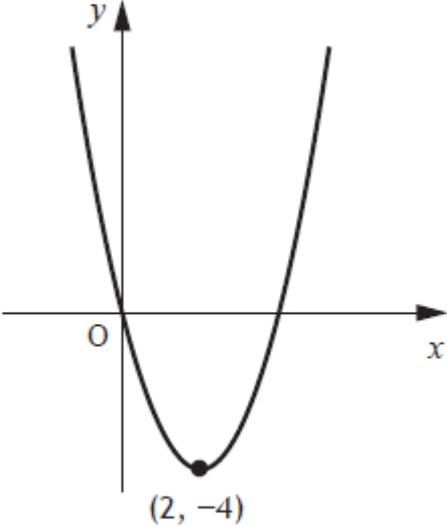
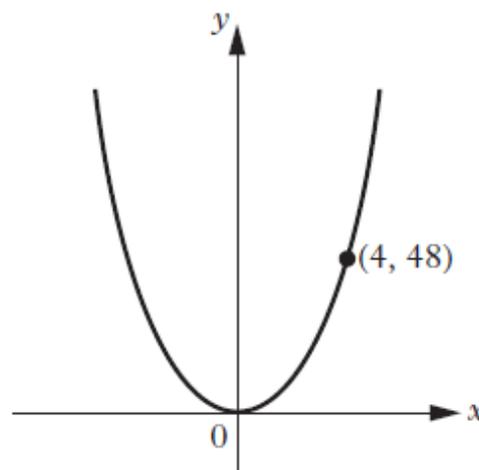
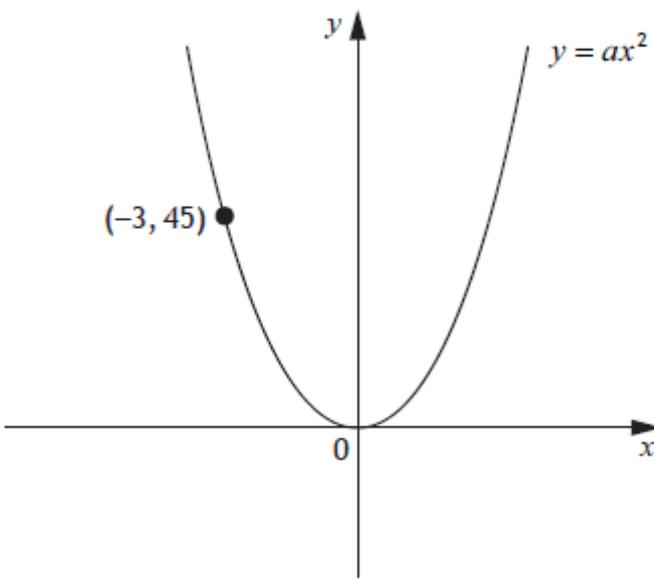
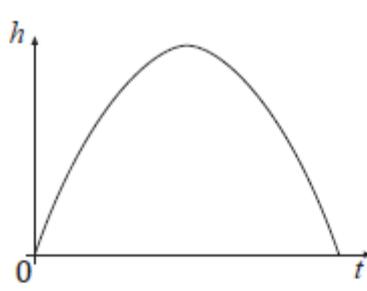


2018 PI Q8	Determine the nature of the roots of the function $f(x) = 2x^2 + 4x + 5$.	2
Ans	<i>There are no real roots, since $b^2 - 4ac < 0$.</i>	
2018 PI Q19	<p>(a) (i) Express $x^2 - 6x - 81$ in the form $(x - p)^2 + q$.</p> <p>(ii) Hence state the equation of the axis of symmetry of the graph of $y = x^2 - 6x - 81$.</p> <p>(b) The roots of the equation $x^2 - 6x - 81 = 0$ can be expressed in the form $x = d \pm d\sqrt{e}$.</p> <p>Find, algebraically, the values of d and e.</p>	2 1 4
Ans	<i>(a)(i) $(x - 3)^2 - 90$ (ii) $x = 3$ (b) $d = 3, e = 10$</i>	
2017 PI Q14	<p>The graph below shows a parabola with equation of the form $y = (x + a)^2 + b$.</p>  <p>The equation of the axis of symmetry of the parabola is $x = -5$.</p> <p>(a) State the value of a.</p> <p>The point $(-3, 8)$ lies on the parabola.</p> <p>(b) Calculate the value of b.</p>	1 2
Ans	<i>(a) $a = 5$ (b) $b = 4$</i>	

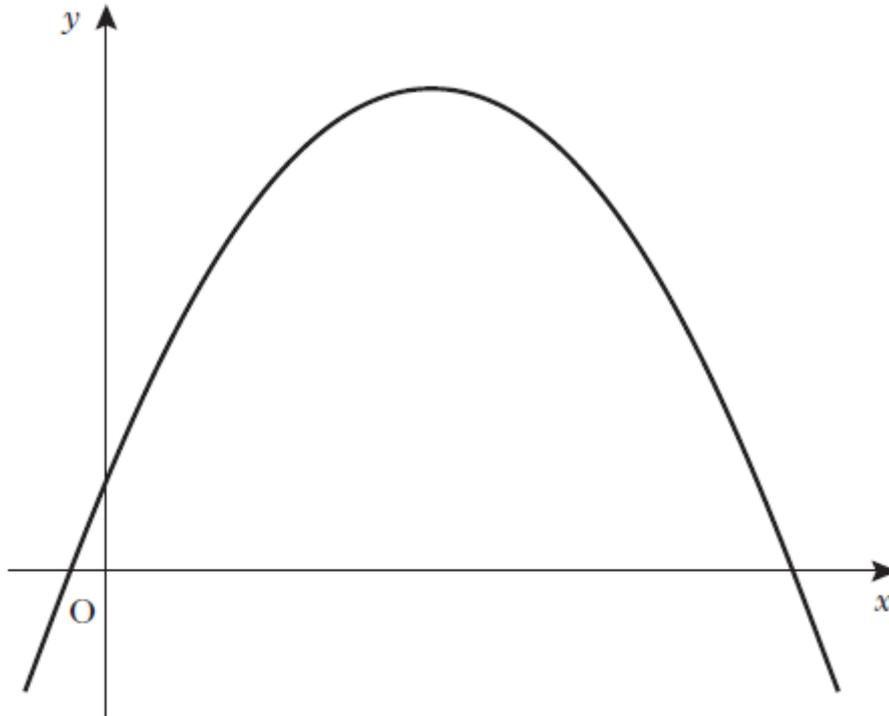
2016 P1 Q10	<p>Sketch the graph of $y = (x - 3)^2 + 1$.</p> <p>On your sketch, show clearly the coordinates of the turning point and the point of intersection with the y-axis.</p>	3
Ans	Graph drawn with a minimum turning point at $(3, 1)$ and a y -intercept = 10.	
2016 P2 Q9	Express $x^2 + 8x - 7$ in the form $(x + a)^2 + b$.	2
Ans	$(x + 4)^2 - 23$	
2015 P1 Q7	<p>The graph below shows part of the parabola with equation of the form</p> $y = (x + a)^2 + b.$  <p>The minimum turning point $(2, -4)$ is shown in the diagram.</p> <p>(a) State the values of</p> <p>(i) a</p> <p>(ii) b.</p> <p>(b) Write down the equation of the axis of symmetry of the graph.</p>	1 1 1
Ans	$(a)(i) -2$ $(ii) -4$ $(b) x = 2$	

2015 PI Q4	<p>The diagram below shows the graph with equation $y = kx^2$ passing through the point (4, 48).</p>  <p>Find the value of k.</p>	2
Ans	$k = 3$	
2014 PI Q3	<p>Express $x^2 - 14x + 44$ in the form $(x - a)^2 + b$.</p>	2
Ans	$(x - 7)^2 - 5$	
2014 PI Q7	<p>The diagram below shows part of the graph of $y = ax^2$</p>  <p>Find the value of a.</p>	2
Ans	$a = 5$	

2014 PI Q13b	<p>The diagram below shows the path of a small rocket which is fired into the air. The height, h metres, of the rocket after t seconds is given by</p> $h(t) = 16t - t^2$  <p>(a) After how many seconds will the rocket first be at a height of 60 metres?</p> <p>(b) Will the rocket reach a height of 70 metres? Justify your answer.</p>	4 3
Ans	(a) 6 seconds (b) No, because the maximum height reached is 64m	
2014 PI Q8	<p>A parabola has equation $y = (x - 2)^2 - 5$.</p> <p>(a) Write down the coordinates of the turning point of the parabola.</p> <p>(b) Does this parabola have a maximum or a minimum turning point?</p>	2 1
Ans	(a) (2, -5) (b) minimum turning point	

2013 P1 Q9

The diagram below shows part of the graph of $y = 20 - (x - 4)^2$.



(a) State the coordinates of the maximum turning point.

(b) State the equation of the axis of symmetry.

2

1

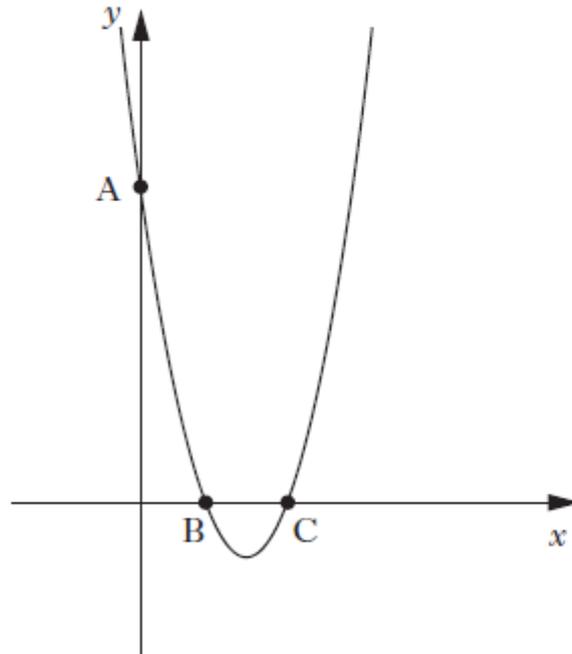
Ans (a) (4, 20) (b) $x = 4$

The equation $x^2 - 6x + 8 = 0$ can also be written as $(x - 2)(x - 4) = 0$.

(a) Write down the roots of the equation $x^2 - 6x + 8 = 0$.

1

Part of the graph of $y = x^2 - 6x + 8$ is shown below.



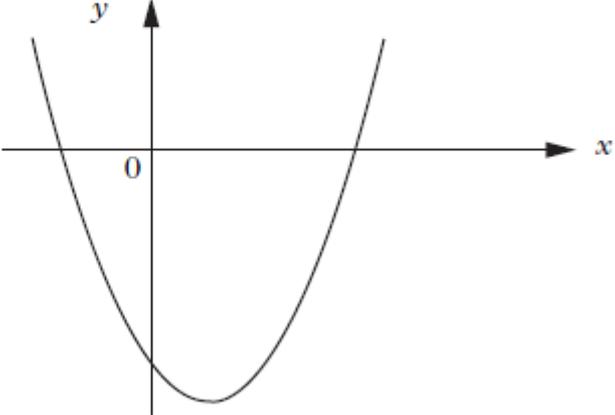
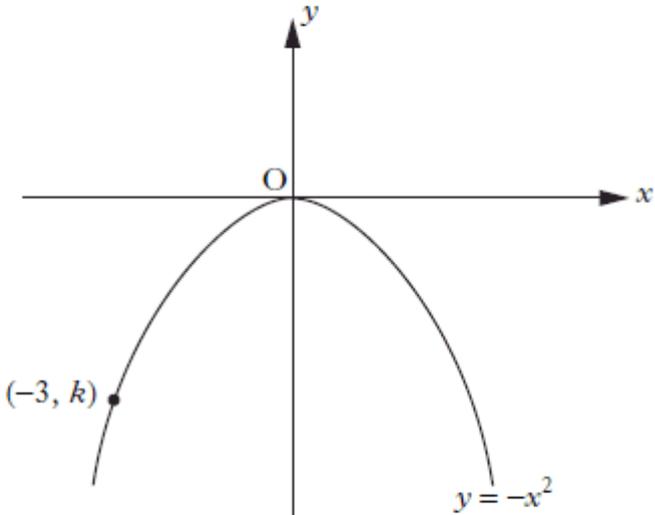
(b) State the coordinates of the points A, B and C.

3

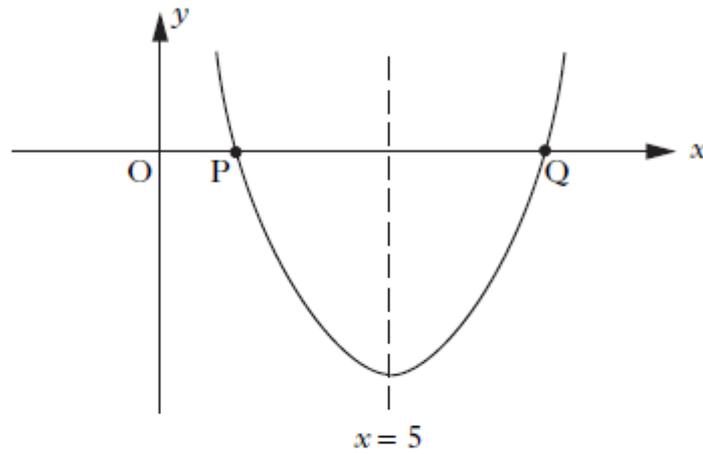
(c) What is the equation of the axis of symmetry of this graph?

1

Ans (a) 2 and 4 (b) $A(0,8)$, $B(2,0)$, $C(4,0)$ (c) $x = 3$

2011 P1 Q9	<p>(a) Factorise $x^2 - 4x - 21$.</p> <p>(b) Hence write down the roots of the equation</p> $x^2 - 4x - 21 = 0.$ <p>(c) The graph of $y = x^2 - 4x - 21$ is shown in the diagram.</p>  <p>Find the coordinates of the turning point.</p>	2 1 3
Ans	<p>(a) $(x + 3)(x - 7)$ (b) $-3, 7$ (c) $(2, -25)$</p>	
2010 P1 Q5	<p>The diagram below shows the graph of $y = -x^2$.</p>  <p>The point $(-3, k)$ lies on the graph. Find the value of k.</p>	1
Ans	<p>$k = -9$</p>	

The graph below shows part of a parabola with equation of the form $y = (x + a)^2 + b$.



The equation of the axis of symmetry of the parabola is $x = 5$.

- (a) State the value of a .
- (b) P is the point $(2, 0)$. State the coordinates of Q.
- (c) Calculate the value of b .

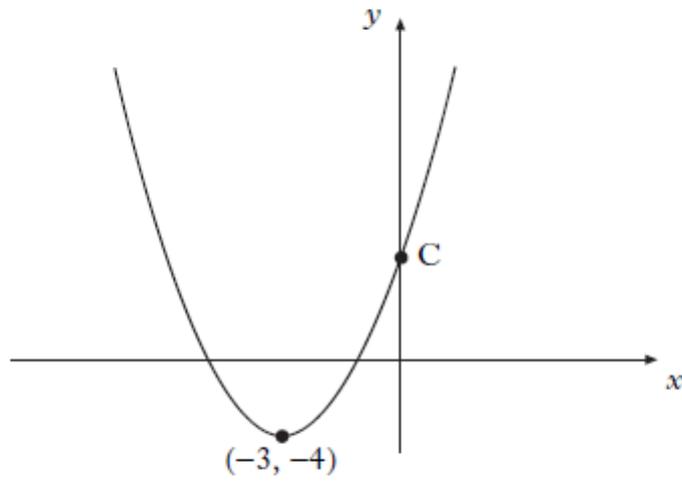
1
1
2

Ans (a) $a = -5$ (b) $(8, 0)$ (c) $b = -9$

2009 P1 Q9

The diagram below shows part of a parabola with equation of the form

$$y = (x + a)^2 + b.$$



- (a) Write down the equation of the axis of symmetry of the graph.
- (b) Write down the equation of the parabola.
- (c) Find the coordinates of C.

1

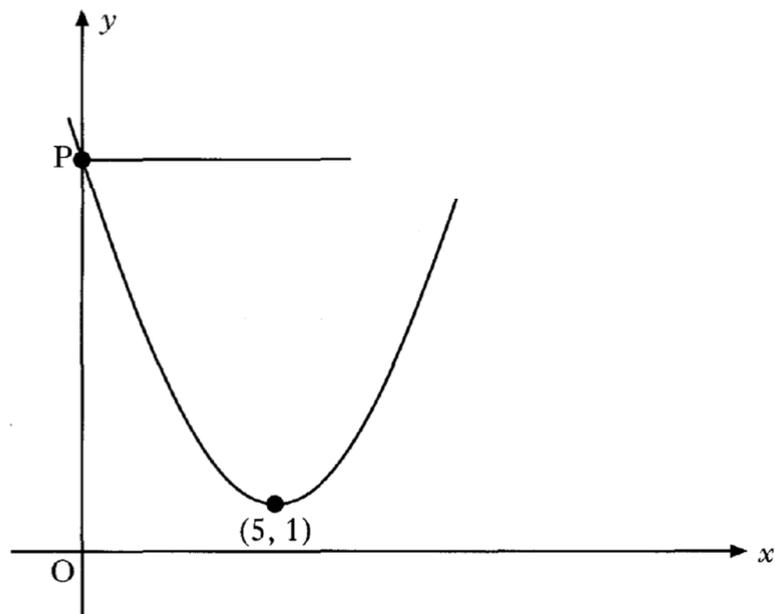
2

2

Ans (a) $x = -3$ (b) $y = (x + 3)^2 - 4$

The graph below shows part of a parabola with equation of the form

$$y = (x + a)^2 + b.$$



- (a) State the values of a and b .
- (b) State the equation of the axis of symmetry of the parabola.
- (c) The line PQ is parallel to the x -axis.
Find the coordinates of points P and Q.

2

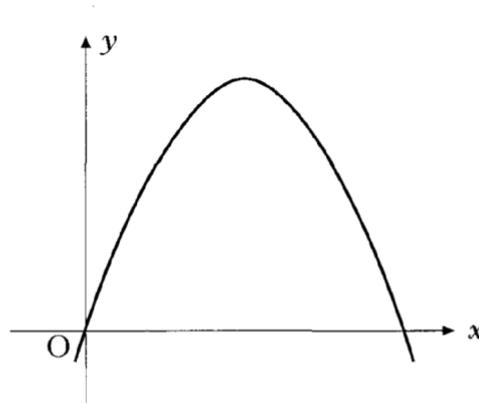
1

3

Ans (a) $a = -5, b = 1$ (b) $x = 5$ (c) $P(0, 26), Q(10, 26)$

2007 P1 Q7b

The graph shown below is part of the parabola with equation $y = 8x - x^2$.



(a) By factorising $8x - x^2$, find the roots of the equation

$$8x - x^2 = 0.$$

(b) State the equation of the axis of symmetry of the parabola.

(c) Find the coordinates of the turning point.

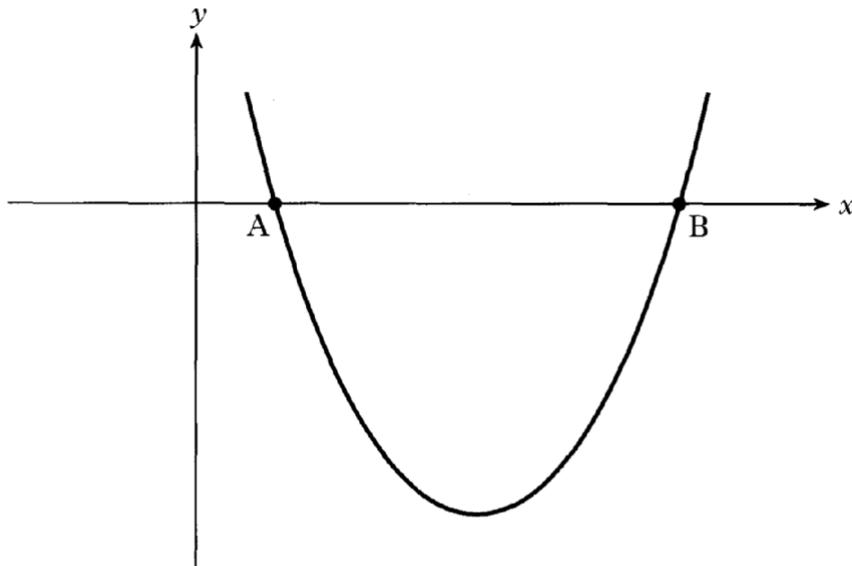
2

1

2

Ans (a) $x = 0, 8$ (b) $x = 4$ (c) $(4, 16)$

2006 P1 Q7



The equation of the parabola in the above diagram is

$$y = (x - 3)^2 - 4.$$

(a) State the coordinates of the minimum turning point of the parabola.

(b) State the equation of the axis of symmetry of the parabola.

(c) A is the point $(1, 0)$. State the coordinates of B.

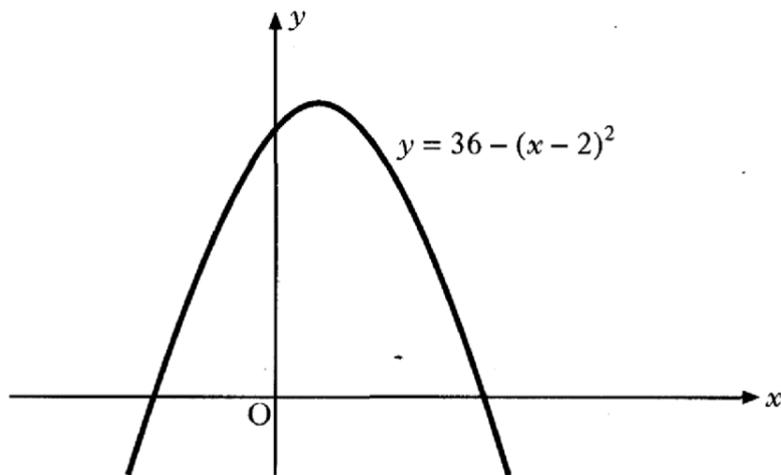
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Ans (a) $(3, -4)$ (b) $x = 3$ (c) $(5, 0)$

The diagram below shows part of the graph of $y = 36 - (x - 2)^2$.



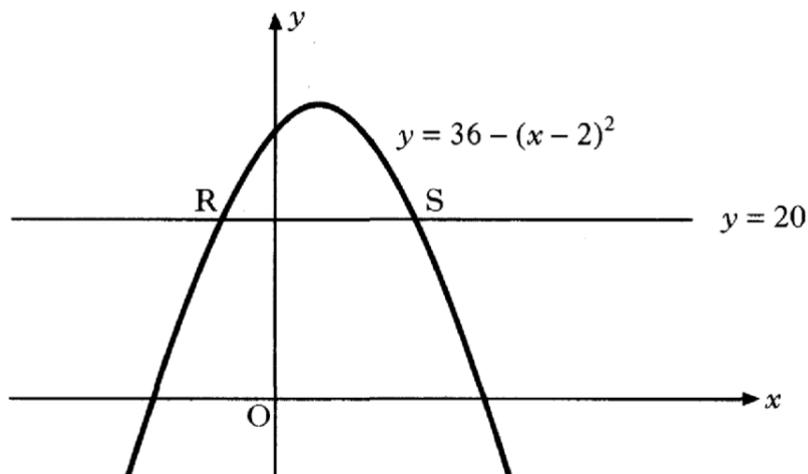
- (a) State the coordinates of the maximum turning point.
 (b) State the equation of the axis of symmetry.

2

1

The line $y = 20$ is drawn.

It cuts the graph of $y = 36 - (x - 2)^2$ at R and S as shown below.

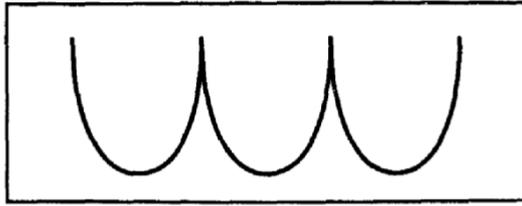


- (c) S is the point (6, 20). Find the coordinates of R.

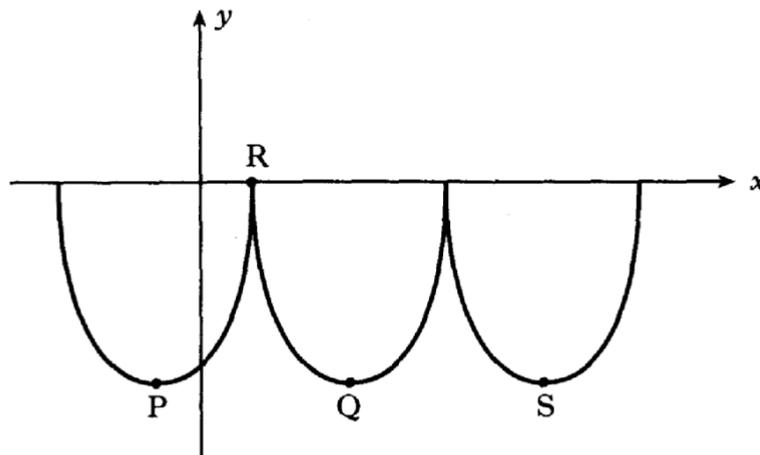
2

Ans (a) (2, 36) (b) $x = 2$ (c) (-2, 20)

William Watson's Fast Foods use a logo based on parts of three identical parabolas.



This logo is represented on the diagram below.

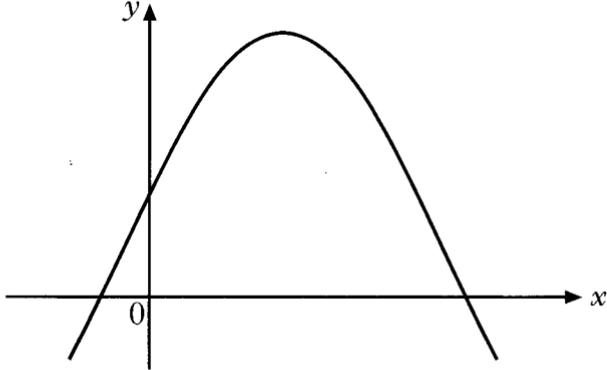
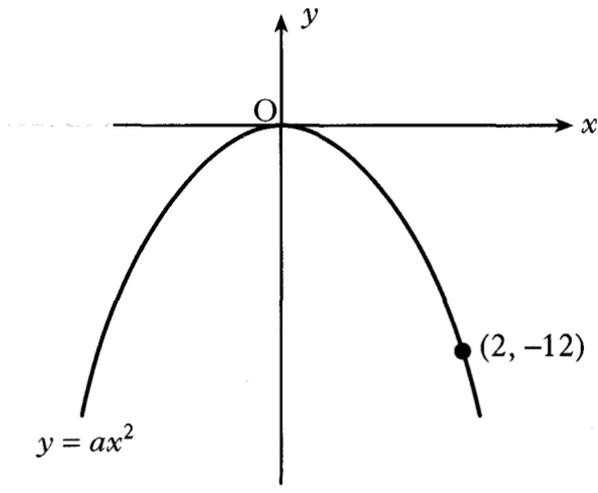


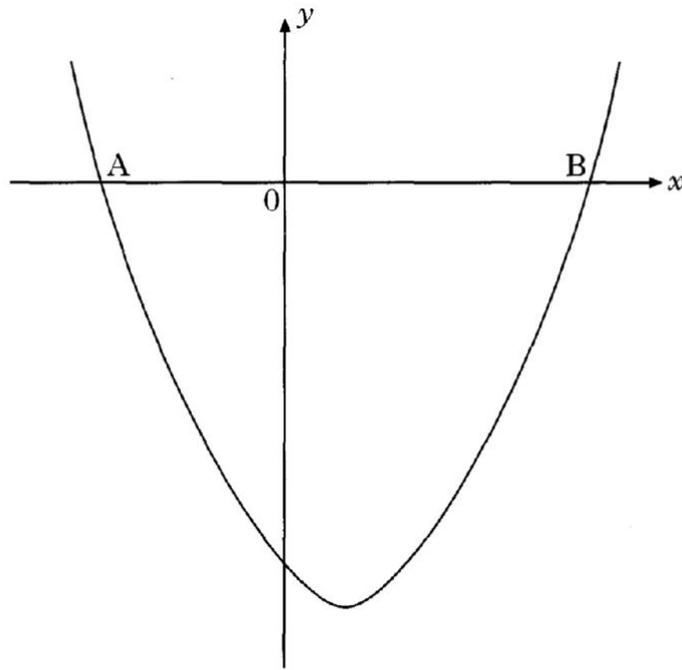
The first parabola has turning point P and equation $y = (x + 2)^2 - 16$.

- (a) State the coordinates of P.
- (b) If R is the point (2, 0), find the coordinates of Q, the minimum turning point of the second parabola.
- (c) Find the equation of the parabola with turning point S.

2
1
2

Ans (a) $P(-2, -16)$ (b) $Q(6, -16)$ (c) $y = (x - 14)^2 - 16$

2003 PI Q8c	<p>(a) Factorise $7 + 6x - x^2$.</p> <p>(b) Hence write down the roots of the equation</p> $7 + 6x - x^2 = 0.$ <p>(c) The graph of $y = 7 + 6x - x^2$ is shown in the diagram.</p>  <p>Find the coordinates of the turning point.</p>	2 1 3
Ans	<p>(a) $(7 - x)(1 + x)$ (b) $7, -1$ (c) $(3, 16)$</p>	
2002W PI Q4	<p>The diagram below shows the graph of $y = ax^2$.</p>  <p>Find the value of a.</p>	2
Ans	<p>$a = -3$</p>	



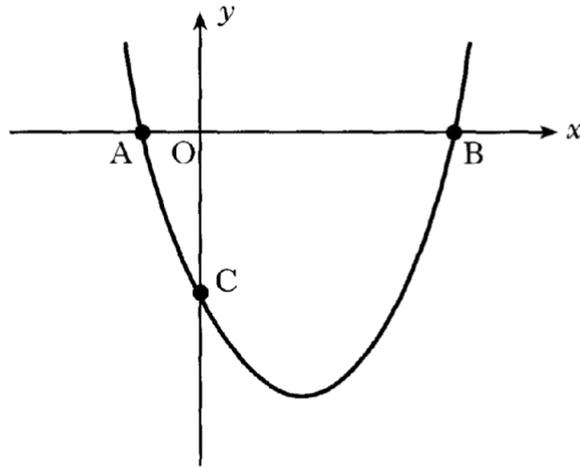
The equation of the parabola in the above diagram is

$$y = (x - 1)^2 - 16.$$

- (a) State the coordinates of the minimum turning point of the parabola.
- (b) State the equation of the axis of symmetry of the parabola.
- (c) The parabola cuts the x -axis at A and B. Find the length of AB.

2
1
3

Ans (a) (1, -16) (b) $x = 1$ (c) $AB = 8$



The equation of the parabola in the above diagram is

$$y = (x - 2)^2 - 9.$$

- (a) State the coordinates of the minimum turning point of the parabola. 2
- (b) Find the coordinates of C. 2
- (c) A is the point $(-1, 0)$. State the coordinates of B. 1

Ans (a) $(2, -9)$ (b) $(0, -5)$ (c) $(5, 0)$