

Turning Points by Completing the Square

For Pearson Edexcel GCSE Mathematics (1MA1) • Higher tier

Name _____

Total marks: **26**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method.

1 Write down the coordinates of the turning point on the graph of

(a) $y = (x - 4)^2 + 9$

.....
(1)

(b) $y = (x + 10)^2 - 3$

.....
(1)

(Total for Question 1 is 2 marks)

2 (a) Write $x^2 + 4x - 1$ in the form $(x + a)^2 + b$

.....
(2)

(b) Write down the coordinates of the turning point of the graph of $y = x^2 + 4x - 1$

.....
(1)

(Total for Question 2 is 3 marks)

- 3 The graph of $y = x^2 - 5x + 2$ has a turning point.
Find the coordinates of the turning point.

.....
(3)

(Total for Question 3 is 3 marks)

- 4 Find the coordinates of the turning point of the curve $y = 3x^2 + 6x + 8$

.....
(3)

(Total for Question 4 is 3 marks)

- 5 The curve $y = 8 + 6x - x^2$ has a maximum point M .
Find the coordinates of M .

(..... ,)
(3)

(Total for Question 5 is 3 marks)

- 6 A curve has equation $y = x^2 + px + q$
The turning point of the curve is $(-3, 7)$
Find the value of p and the value of q .

$$p = \dots\dots\dots q = \dots\dots\dots$$

(3)

(Total for Question 6 is 3 marks)

- 7 A ball is thrown upwards from the top of a wall.
Its height, h metres, above the ground t seconds after it is thrown is given by
$$h = 2 + 20t - 5t^2$$

By completing the square, find the greatest height the ball reaches and the time when it reaches this height.
You must show all your working.

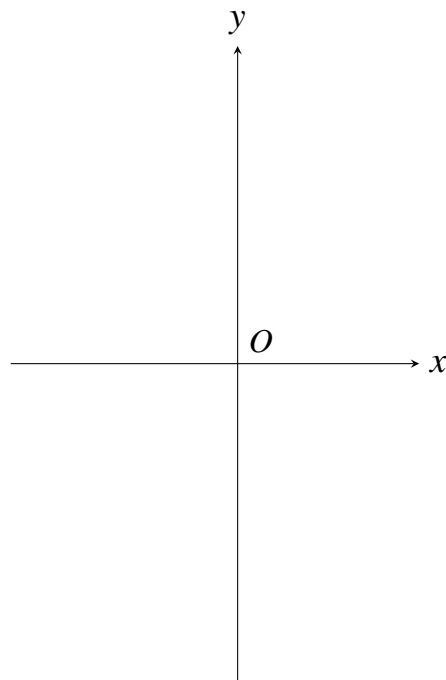
(4)

(Total for Question 7 is 4 marks)

- 8 (a) Write $x^2 + 2x - 4$ in the form $(x + a)^2 + b$

.....
(2)

- (b) Hence sketch the graph of $y = x^2 + 2x - 4$ on the axes below.
Show the coordinates of the turning point and give the exact x -coordinates of the points where the graph crosses the x -axis.



(3)
(Total for Question 8 is 5 marks)
