AQA Qualifications

AQA Level 2 Certificate

FURTHER MATHEMATICS

Level 2 (8360)

Worksheet 9

Coordinate Geometry - Calculus

Version 2.0

Our specification is published on our website (www.aqa.org.uk). We will let centres know in writing about any changes to the specification. We will also publish changes on our website. The definitive version of our specification will always be the one on our website, this may differ from printed versions.

You can get further copies of this Teacher Resource from:
The GCSE Mathematics Department
AQA
Devas Street
Manchester
M16 6EX

Or, you can download a copy from our All About Maths website (http://allaboutmaths.aqa.org.uk/).

Copyright © 2012 AQA and its licensors. All rights reserved.

AQA retains the copyright on all its publications, including the specifications. However, registered centres for AQA are permitted to copy material from this specification booklet for their own internal use.

AQA Education (AQA) is a registered charity (number 1073334) and a company limited by guarantee registered in England and Wales (number 3644723). Our registered address is AQA, Devas Street, Manchester M15 6EX.

9 Coordinate Geometry - Calculus

Question 1

For each of these straight lines, work out

(i) The gradient of the line *(1 mark for each part)*

(ii) The gradient of the line that is perpendicular to the given line *(1 mark for each part)*

(iii) The y-intercept of the line *(1 mark for each part)*

(a) $y = 5x - 4$ (b) $3y = 9 - 6x$ (c) $3y - 12 = 2x$

(d) $5x - 2y + 15 = 0$ (e) $\frac{x}{4} - \frac{y}{3} = 2$

Question 2

For each of these straight line segments, AB, work out

(i) The mid-point of AB *(2 marks for each part)*

(ii) The gradient of AB *(1 mark for each part)*

(iii) The length of AB, giving your answer as an integer or a surd *(2 marks for each part)*

(a) $A = (-3, -4)$ $B = (4, 3)$ (b) $A = (-4, 1)$ $B = (1, 5)$ (c) $A = (5, -2)$ $B = (0, 10)$

(d) $A = (-2, -6)$ $B = (-6, 0)$ (e) $A = (1, 9)$ $B = (9, -6)$ (f) $A = (7, 1)$ $B = (-5, -3)$

Question 3

In each of these line segments, B lies between A and C.

Work out the coordinates of C in each case. *(2 marks for each part)*

(a) $A = (-1, 3)$ $B = (1, 1)$ and $AB : BC = 1 : 2$

(b) $A = (-4, -2)$ $B = (2, -5)$ and $AB : BC = 3 : 1$

(c) $A = (11, 0)$ $B = (1, -5)$ and $AB : BC = 5 : 3$

(d) $A = (-6, 2)$ $B = (0, 4)$ and $AB : BC = 2 : 3$

(e) $A = (2, -9)$ $B = (-3, 1)$ and $AB : BC = 5 : 4$

Question 4

Work out the coordinates of the points of intersection of the curve $y = x^2 + 7$ and the straight line $y = 5x + 1$ *(4 marks)*

Question 5

Line L has equation $y + 3x = 7$

Line N is perpendicular to line L and passes through $(3, -1)$.

Work out the equation of line N.

Give your answer in the form $y = ax + b$ *(4 marks)*

Question 6

Work out $\frac{dy}{dx}$ for each of the following

(a) $y = 7x + 3$ *(1 mark)*

(b) $y = 8 - 5x + x^2$ *(2 marks)*

(c) $y = 3x^3 + 4x$ *(2 marks)*

(d) $y = x^3 - 7x^2 + 10x - 1$ *(2 marks)*

(e) $y = 4x(x^2 + 2x - 3)$ *(3 marks)*

(f) $y = (3x - 5)(x + 8)$ *(3 marks)*

(g) $y = x(7 - x)(6 - 2x)$ *(3 marks)*

(h) $y = (x + 3)(x - 1)(x - 6)$ *(4 marks)*

Question 7

A curve has equation $y = x^3 + x^2 + 2x - 4$

Work out the equation of the tangent to this curve where $x = -2$

Give your answer in the form $y = ax + b$ *(5 marks)*

Question 8

A curve has equation $y = x^3 + 2x^2 - 9x + 3$

Work out the equation of the normal to this curve at the point (1, –3)

Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. *(5 marks)*

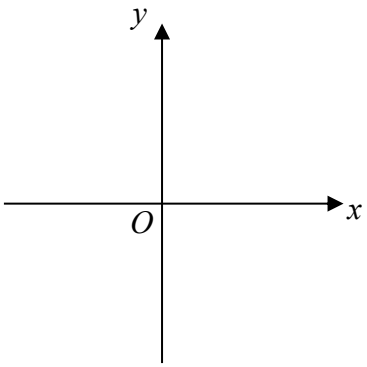
Question 9

A curve has equation $y = x^3 - 6x^2 + 20$

(a) Write down an expression for $\frac{dy}{dx}$ *(1 mark)*

(b) Work out the coordinates of the stationary points and determine whether they are maximum or minimum. *(5 marks)*

(c) Sketch the curve on the axes clearly labelling the stationary points. *(2 marks)*



Question 10

A curve has equation $y = x^3 - x^2 + k\,x - 2$

(a) Write down an expression for $\frac{dy}{dx}$ *(1 mark)*

(b) The curve has a minimum point at the point where $x = 2$

Work out the value of k. *(2 marks)*

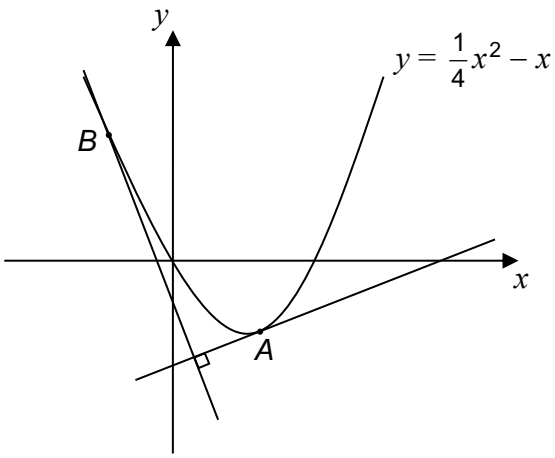
(c) Work out the x coordinate of the maximum point on the curve. *(3 marks)*

Question 11

(a) Show that the line $y = \frac{1}{2}x - \frac{9}{4}$ is the tangent to the curve $y = \frac{1}{4}x^2 - x$

at the point A $(3, -\frac{3}{4})$. *(4 marks)*

(b) The point *B* on the curve is such that the tangent at *B* is perpendicular to the tangent at *A*, as shown in the diagram.



Not drawn accurately

Work out the coordinates of *B*. *(4 marks)*