

Lesson 13

A-Level Pure Mathematics, Year 1 Additional Mathematics Coordinate Geometry

13.1 Test

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 80

Question 1

The equation of a circle is

$$(x + 11)^2 + (y - 13)^2 = 49$$

State the coordinates of the circle's centre, and its radius.

[2 marks]

Question 2

Write down the equation of the circle with centre $(15, -8)$ which passes through the origin.

[2 marks]

Question 3

By completing the square, or otherwise, determine the centre and radius of the following circle;

$$x^2 + y^2 - 12x + 10y - 20 = 0$$

[5 marks]

Question 4

Differentiate

(i)

$$y = 9x^5 - 7x^3 + 4$$

[2 marks]**(ii)**

$$y = 100x^{0.35}$$

[2 marks]**(iii)**

$$y = \frac{2}{3}x^{-9}$$

[2 marks]**Question 5**

The equation of the curve, plotted on the next page, is

$$y = \frac{x^3}{16} - 3$$

(i) Write down the gradient equation, $\frac{dy}{dx}$, for the curve.**[2 marks]****(ii)** Use your part (i) answer to find the value of the gradient on the curve when $x = 4$ **[1 mark]****(iii)** Use your part (ii) answer to determine the equation of the tangent to the curve at the point (4, 1)**[2 marks]**

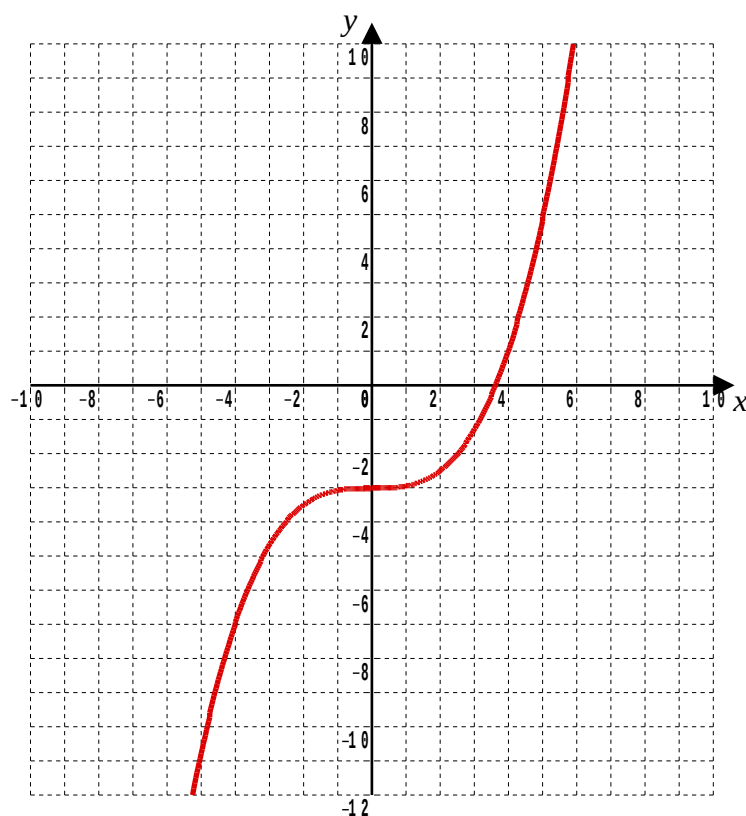
- (iv) Use your part (ii) answer to determine the gradient of the normal to the curve at the point (4, 1)

[1 mark]

- (v) Find the equation of the normal to the curve at the point (4, 1)

[2 marks]

- (vi) On the graph, add your part (iii) tangent, and your part (v) normal, clearly indicating which is which and making sure they both passes through the point (4, 1)



[2 marks]

Question 6

$$x^2 + (y - 2)^2 = 8^2$$

Is the point (7, 6) inside, outside, or on the circumference of this circle ?
Justify your answer.

[3 marks]

Question 7

Find the point(s) of intersection, if any, of the circle

$$(x + 5)^2 + (y - 3)^2 = 32$$

and the line

$$y = 4x + 3$$

[6 marks]

Question 8

AB is a diameter of a circle, where A is $(-2, 4)$ and B is $(6, 8)$

Find

(i) the exact length of AB

[2 marks]

(ii) the coordinates of the midpoint of AB

[2 marks]

(iii) the equation of the circle

[3 marks]

(iv) the gradient of the line through A and B

[2 marks]

(v) the equation of the tangent to the circle at B

[3 marks]

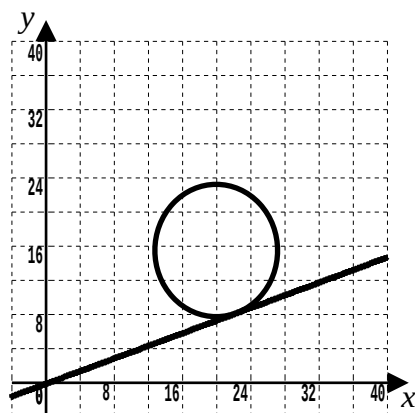
(vi) the points of intersection of the circle with the y -axis

[3 marks]

Question 9

A circle has centre $(20, 15)$ and radius 7

Find the length of the tangential line from the origin to the circle.



[6 marks]

Question 10

A-Level Examination Question from June 2010, Paper C2, Q10 (Edexcel)

The circle C has centre $A (2, 1)$ and passes through the point $B (10, 7)$

(a) Find an equation for C

[4 marks]

The line l_1 is the tangent to C at the point B

(b) Find an equation for l_1

[4 marks]

The line l_2 is parallel to l_1 and passes through the mid-point of AB

Given that l_2 intersects C at the points P and Q

(c) Find the length of PQ , giving your answer in its simplest surd form

[3 marks]

Question 11

A-Level Examination Question from January 2016, IAL, Paper C12, Q12 (Edexcel)

$$f(x) = \frac{(4 + 3\sqrt{x})^2}{x}, \quad x > 0$$

- (a) Show that $f(x) = Ax^{-1} + Bx^k + C$, where A , B , C and k are constants to be determined.

[4 marks]

- (b) Hence find $f'(x)$

[2 marks]

- (c) Find an equation of the tangent to the curve $y = f(x)$ at the point where $x = 4$

[4 marks]

Question 12

A-Level Examination Question from January 2019, IAL Paper C12, Q3 (Edexcel)

A curve has equation

$$y = \sqrt{2} x^2 - 6\sqrt{x} + 4\sqrt{2}, \quad x > 0$$

Find the gradient of the curve at the point $P(2, 2\sqrt{2})$

Write your answer in the form $a\sqrt{2}$, where a is a constant

[4 marks]

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