Revision – Unit3 Coordinate Geometry

(Length of a line segment and midpoint, Parallel and perpendicular lines, Equations of straight lines, the equation of a circle, Problems involving intersections of lines and circles)

Nov/11/2024/Q5

The equation of a curve is such that $\frac{dy}{dx} = 4x - 3\sqrt{x} + 1$.

(a) Find the x-coordinate of the point on the curve at which the gradient is $\frac{11}{2}$. **[3]**

(b) Given that the curve passes through the point (4, 11), find the equation of the curve. **[4]**

Nov/11/2024/Q6

Circles C_1 and C_2 have equations

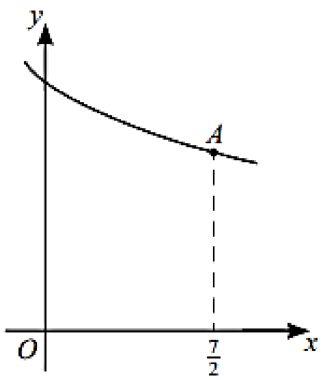
$$x^2 + y^2 + 6x - 10y + 18 = 0 \text{ and } (x-9)^2 + (y+4)^2 - 64 = 0$$

respectively.

(a) Find the distance between the centres of the circles. **[4]**

P and Q are points on C_1 and C_2 respectively. The distance between P and Q is denoted by d.

(b) Find the greatest and least possible values of d. **[3]**



Nov/
11/
2024/Q7

The diagram shows part of the curve with equation $y = \frac{12}{\sqrt[3]{2x+1}}$. The point A on the curve has coordinates $\left(\frac{7}{2}, 6\right)$.

(a) Find the equation of the tangent to the curve at A. Give your answer in the form $y = mx + c$. **[4]**

(b) Find the area of the region bounded by the curve and the lines $x = 0$, $x = \frac{7}{2}$ and $y = 0$. **[4]**

The equation of a curve is $y = 2x^2 - 3$. Two points A and B with x-coordinates 2 and $(2 + h)$ respectively lie on the curve. Nov/ 12/ 2024/Q3

(a) Find and simplify an expression for the gradient of the chord AB in terms of h. **[3]**

(b) Explain how the gradient of the curve at the point A can be deduced from the answer to part **(a)**, and state the value of this gradient. [2]

The equation of a circle is $x^2+y^2+px+2y+q=0$, where p and q are constants. Nov/12/2024/Q8

(a) Express the equation in the form $(x-a)^2+(y-b)^2=r^2$, where a is to be given in terms of p and r^2 is to be given in terms of p and q. [2]

The line with equation $x+2y=10$ is the tangent to the circle at the point $A(4, 3)$.

(b) **(i)** Find the equation of the normal to the circle at the point A. [3]

(ii) Find the values of p and q. [5]

Points A and B have coordinates (4, 3) and (8, −5) respectively. A circle with radius 10 passes through the points A and B. Nov/13/2024/Q10

(a) Show that the centre of the circle lies on the line $y = \frac{1}{2}x - 4$. [4]

(b) Find the two possible equations of the circle. [5]

The equation of a circle is $(x-3)^2+y^2=18$. The line with equation $y=mx+c$ passes through the point $(0,-9)$ and is a tangent to the circle.

Find the two possible values of m and, for each value of m, find the coordinates of the point at which the tangent touches the circle. [8]

June/11/2024/Q10

The equation of a circle is $(x-6)^2+(y+a)^2=18$. The line with equation $y=2a-x$ is a tangent to the circle. June/12/2024/Q7

(a) Find the two possible values of the constant a. **[5]**

(b) For the greater value of a, find the equation of the diameter which is perpendicular to the given tangent. **[3]**

A circle with equation $x^2 + y^2 - 6x + 2y - 15 = 0$ meets the y-axis at the points A and B. The tangents to the circle at A and B meet at the point P. June/13/2024/Q8

Find the coordinates of P. [8]

A curve has the equation $y = \frac{3}{2x^2 - 5}$.

Find the equation of the normal to the curve at the point $(2, 1)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

March/ 12/ 2024 /Q5

The straight line $y = x + 5$ meets the curve $2x^2 + 3y^2 = k$ at a single point P.

(a) Find the value of the constant k. [4]

March/ 12/ 2024 /Q7

(b) Find the coordinates of P. **[2]**

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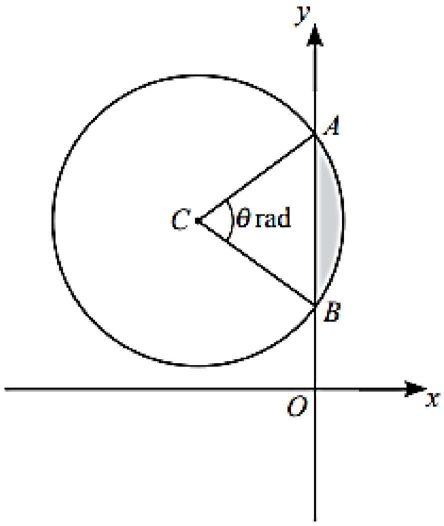

The diagram shows the circle with centre $C(-4, 5)$ and radius $\sqrt{20}$ units. The circle intersects the y-axis at the points A and B. The size of angle ACB is θ radians.

(a) Find the equation of the tangent to the circle at the point $(-6, 9)$. **[3]**

(b) Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$. [2]

(c) Find the value of θ correct to 4 significant figures. **[3]**

(d) Find the perimeter and area of the segment shaded in the diagram. **[4]**