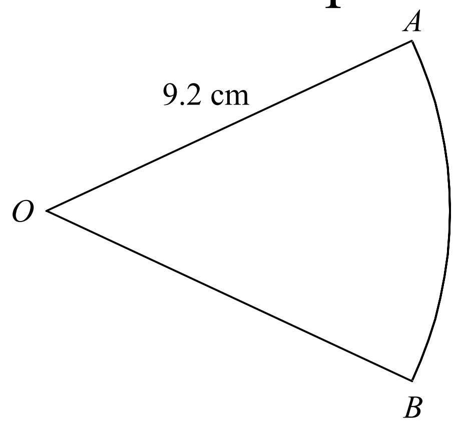
Core Mathematics C2 Paper A

1.



The diagram shows the sector OAB of a circle of radius 9.2 cm and centre O.

Given that the area of the sector is 37.4 cm^2, find to 3 significant figures

(i) the size of $\angle AOB$ in radians, [2]

(ii) the perimeter of the sector. [2]

2.

$$f(x) = x^3 + kx - 20.$$

Given that f(x) is exactly divisible by $(x + 1)$,

(i) find the value of the constant k, [2]

(ii) solve the equation $f(x) = 0$. [4]

3. Given that

$$\frac{dy}{dx} = 3\sqrt{x} - x^2,$$

and that $y = \frac{2}{3}$ when $x = 1$, find the value of y when $x = 4$. [7]

4. A geometric progression has third term 36 and fourth term 27.

Find

(i) the common ratio, [2]

(ii) the fifth term, [2]

(iii) the sum to infinity. [4]

5. *(i)* Solve the equation

$$\log_2 (6 - x) = 3 - \log_2 x.$$ [4]

(ii) Find the smallest integer n such that

$$3^{n-2} > 8^{250}.$$ [4]

6.

$$f(x) = \cos 2x, \quad 0 \leq x \leq \pi.$$

(i) Sketch the curve $y = f(x)$. [2]

(ii) Write down the coordinates of any points where the curve $y = f(x)$ meets the coordinate axes. [3]

(iii) Solve the equation $f(x) = 0.5$, giving your answers in terms of π. [3]

7. *(i)* Find

$$\int \left(x + 5 + \frac{3}{\sqrt{x}}\right) \, dx.$$ [4]

(ii) Evaluate

$$\int_{-2}^{0} (3x - 1)^2 \, dx.$$ [5]

Turn over

8. *(a)* An arithmetic series has a common difference of 7.

Given that the sum of the first 20 terms of the series is 530, find

(i) the first term of the series, [3]

(ii) the smallest positive term of the series. [2]

(b) The terms of a sequence are given by

$$u_n = (n + k)^2, \quad n \geq 1,$$

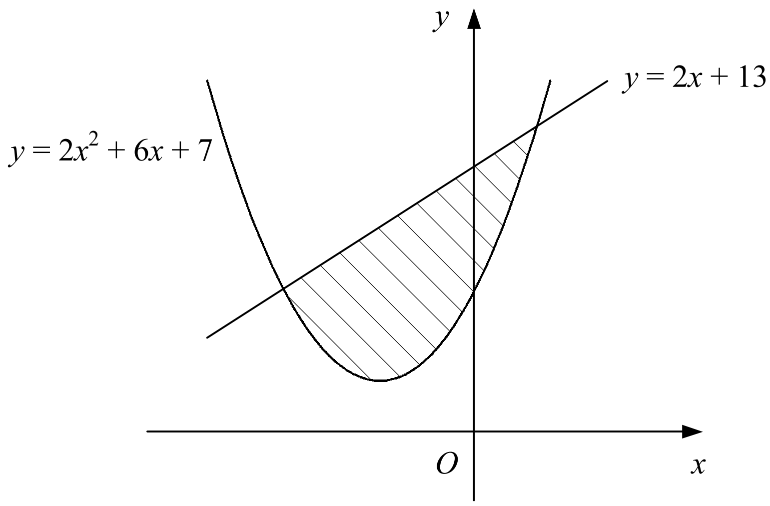
where k is a positive constant.

Given that $u_2 = 2u_1$,

(i) find the value of k, [4]

(ii) show that $u_3 = 11 + 6\sqrt{2}$. [2]

9.



The diagram shows the curve $y = 2x^2 + 6x + 7$ and the straight line $y = 2x + 13$.

(i) Find the coordinates of the points where the curve and line intersect. [4]

(ii) Show that the area of the shaded region bounded by the curve and line is given by

$$\int_{-3}^{1} (6 - 4x - 2x^2)\ \mathrm{d}x.$$ [2]

(iii) Hence find the area of the shaded region. [5]