1. The line $x + 2y = 9$ intersects the curve $xy + 18 = 0$ at the points A and B. Find the coordinates of A and B. [4]

2. Express $2x^2 + 5x + 7$ in the form $a(x + b)^2 + c$, stating the values of a, b and c. Hence, or otherwise, write down the coordinates of the minimum point on the graph of $y = 2x^2 + 5x + 7$ [4]

3. Find the value of the constant c for which the line $y = 2x + c$ is a tangent to the curve $y = 4x$. [4]

4. By using the substitution $y = x^{\frac{1}{3}}$; solve the equation

$$x^{\frac{2}{3}} - 5x^{\frac{1}{3}} + 6 = 0$$ [5]

5. A quadratic function f is defined by

$f : x \rightarrow x^2 + x + 1.$

(i) By means of a sketch, explain why f^{-1} does not exist. [2]

(ii) Find the range of f for the domain $-3 \leq x \leq 2$. [2]

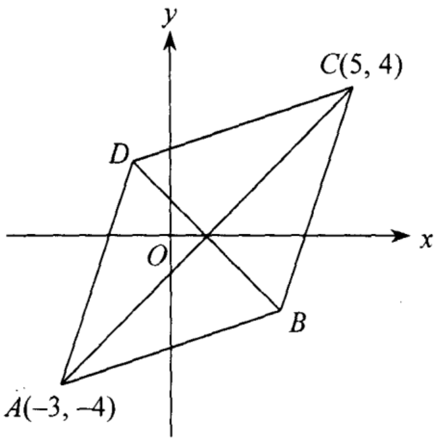
(iii) Given that f^{-1} exists for $x \geq a$.
State the minimum value of a. [2]

6. Three points have coordinates A (2, 6), B(8, 10) and C(6, 0). The perpendicular bisector of AB meets the line BC at D. Find

(i) the equation of the perpendicular bisector of AB in the form $ax + by = c$, [4]

(ii) the coordinates of D. [4]

7.



The diagram shows a rhombus ABCD. The coordinates of A and C are $(-3, -4)$ and $(5, 4)$ respectively.

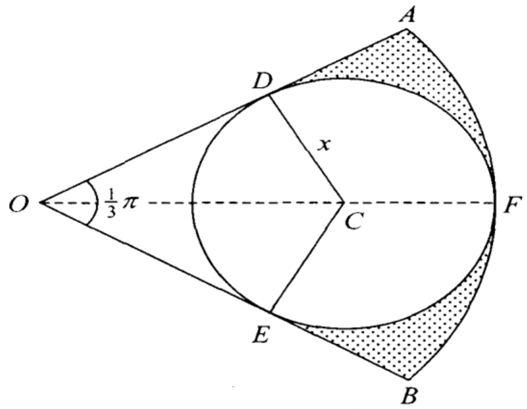
(i) Find the equation of the diagonal BD of the rhombus. [3]

(ii) If the side BC has gradient 3, obtain the coordinates of B and D. [3]

(iii) Show that $AC = 3BD$. [2]

(iv) Show that the area of the rhombus is 32 square units. [2]

8.



In the figure, sector AOB has radius 9 cm and angle $AOB = \frac{1}{3}\pi$ radians. The circle DEF has centre C and radius x cm, and touches OA, OB and the arc AB at D, E and F respectively.

(i) By considering $\sin(C\hat{O}D) = \dfrac{CD}{OC}$, or otherwise,
Find the value of x. [2]

(ii) Show that the area of triangle COD is $\dfrac{9}{2}\sqrt{3}$ cm^2. [2]

(iii) Show that the area of the sector DCF is $3\pi\,\text{cm}^2$. [3]

(iv) Deduce that the total area, S_1 of the shaded regions in the figure is given by [3]

$$S = \frac{3}{2}\left(5\pi - 6\sqrt{3}\right) \text{ cm}^2.$$

9. The equation of a curve is $xy = 12$ and the equation of a line l is $2x + y = \mathrm{k}$, where k is a constant.

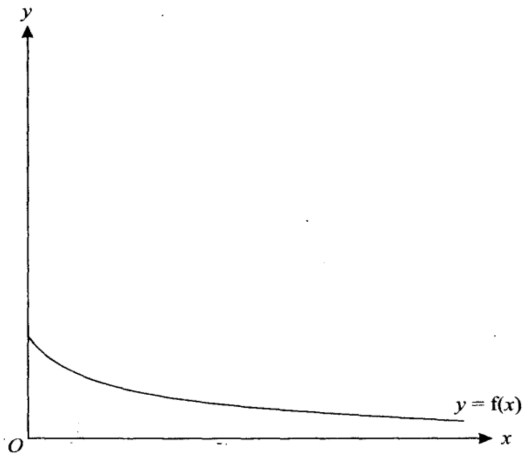
(i) In the case where $\mathrm{k} = 11$, find the coordinates of the points of intersection of l and the curve. [3]

(ii) Find the set of values of k for which l does not intersect the curve. [4]

10

]

]



The diagram shows the graph of $y = \mathrm{f}(x)$,

Where $\mathrm{f} : x \to \dfrac{6}{2x+3}$ for $x \geq 0$.

(i) Find an expression, in terms of x, for $\mathrm{f}^{1}(x)$ and explain how your answer shows that f is a decreasing function.

(ii) Find an expression, in terms of x, for $\mathrm{f}^{-1}(x)$ and find the domain of f^{-1}.

[3]

(iii) Copy the diagram and, on your copy, sketch the graph of $y = \mathrm{f}^{-1}(x)$, making clear the relationship between the graphs.

[4]

The function g is defined by $\mathrm{g} : x \to \dfrac{1}{2}x$ for $x \geq 0$.

(iv) Solve the equation $\mathrm{fg}(x) = \dfrac{3}{2}$

[3]

[3]