

1.

The graph of $y = f(x)$ is transformed to the graph of $y = 3 - f(x)$.

Describe fully, in the correct order, the two transformations that have been combined.

[4]

[illegible]

2.

- (a) Find the first three terms, in ascending powers of x , in the expansion of $(1 + ax)^6$. [1]

.....

.....

.....

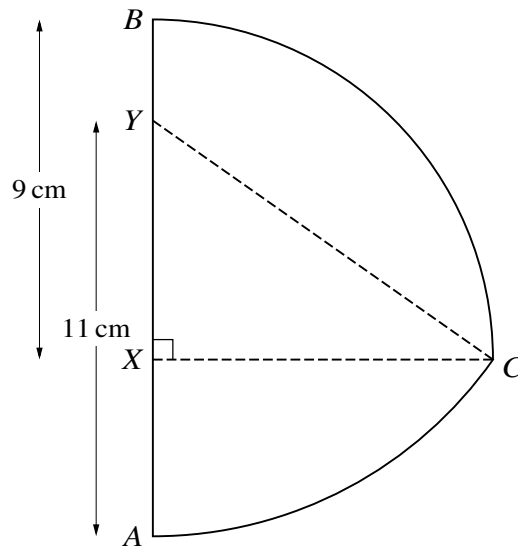
.....

.....

- (b)** Given that the coefficient of x^2 in the expansion of $(1 - 3x)(1 + ax)^6$ is -3 , find the possible values of the constant a . [4]

[illegible]

3.



In the diagram, X and Y are points on the line AB such that $BX = 9$ cm and $AY = 11$ cm. Arc BC is part of a circle with centre X and radius 9 cm, where CX is perpendicular to AB . Arc AC is part of a circle with centre Y and radius 11 cm.

- (a) Show that angle $XYC = 0.9582$ radians, correct to 4 significant figures. [1]

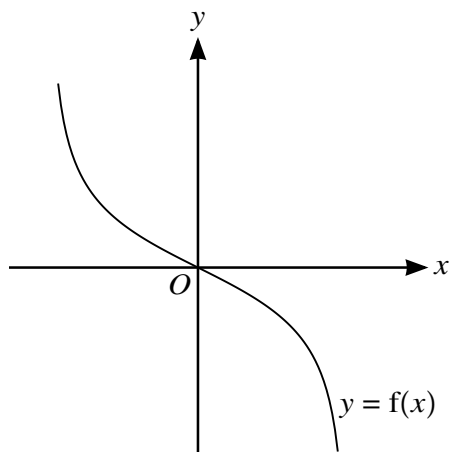
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

(b) Find the perimeter of ABC .

[6]

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no margins, text, or other markings.

4.



The diagram shows the graph of $y = f(x)$.

- (a) On this diagram sketch the graph of $y = f^{-1}(x)$. [1]

It is now given that $f(x) = -\frac{x}{\sqrt{4-x^2}}$ where $-2 < x < 2$.

- (b)** Find an expression for $f^{-1}(x)$. [4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

5.

- (a) Show that the equation $\frac{\tan x + \cos x}{\tan x - \cos x} = k$, where k is a constant, can be expressed as

$$(k+1)\sin^2 x + (k-1)\sin x - (k+1) = 0. \quad [4]$$

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

[4]

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

6.

The line $y = 2x + 5$ intersects the circle with equation $x^2 + y^2 = 20$ at A and B .

- (a) Find the coordinates of A and B in surd form and hence find the exact length of the chord AB .

[7]

[illegible]

A straight line through the point $(10, 0)$ with gradient m is a tangent to the circle.

(b) Find the two possible values of m .

[5]

[illegible]

7.

The equation of a curve is $y = 2x^2 + kx + k - 1$, where k is a constant.

- (a) Given that the line $y = 2x + 3$ is a tangent to the curve, find the value of k . [3]

[illegible]

It is now given that $k = 2$.

- (b)** Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are constants, and hence state the coordinates of the vertex of the curve. [3]

[illegible]

The diagram shows a circle sector OAB. The origin is O. The radius OB is horizontal and labeled $2r$. The angle at O is labeled $\frac{1}{6}\pi \text{ rad}$. A point C is on the radius OA such that the segment OC is labeled r . A line segment connects C and B. The region bounded by the arc AB, the line segment CB, and the line segment CA is shaded gray.

(a) Show that the exact length of BC is $r\sqrt{5 - 2\sqrt{3}}$. [2]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

(b) Find the exact perimeter of the shaded region.

[2]

[illegible]

(c) Find the exact area of the shaded region.

[3]

[illegible]

9.

Functions f and g are such that

$$f(x) = 2 - 3 \sin 2x \quad \text{for } 0 \leq x \leq \pi,$$

$$g(x) = -2f(x) \quad \text{for } 0 \leq x \leq \pi.$$

(a) State the ranges of f and g .

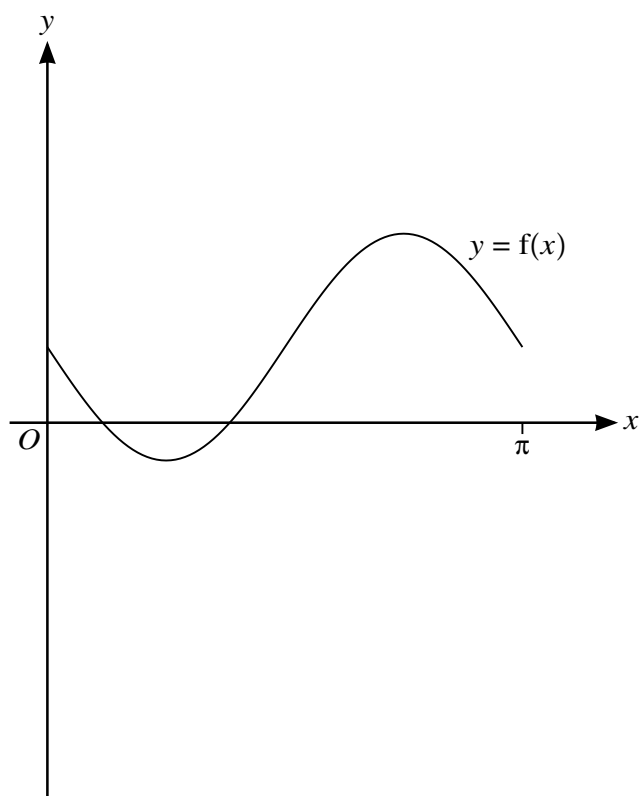
[3]

.....

.....

.....

The diagram below shows the graph of $y = f(x)$.



(b) Sketch, on this diagram, the graph of $y = g(x)$.

[2]

The function h is such that

$$h(x) = g(x + \pi) \quad \text{for } -\pi \leq x \leq 0.$$

(c) Describe fully a sequence of transformations that maps the curve $y = f(x)$ on to $y = h(x)$.

[3]

.....

.....

.....

10.

The equation of a circle with centre C is $x^2 + y^2 - 8x + 4y - 5 = 0$.

- (a) Find the radius of the circle and the coordinates of C . [3]

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

The point $P(1, 2)$ lies on the circle.

- (b) Show that the equation of the tangent to the circle at P is $4y = 3x + 5$. [3]

[illegible]

The point Q also lies on the circle and PQ is parallel to the x -axis.

- (c) Write down the coordinates of Q . [2]

.....

.....

.....

.....

.....

The tangents to the circle at P and Q meet at T .

- (d)** Find the coordinates of T . [3]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.