

Dr Oliver Mathematics
Mathematics: Higher
2026 Paper 1: Non-Calculator
1 hour 15 minutes

The total number of marks available is 55.

You must write down all the stages in your working.

1. Express

(3)

$$2x^2 + 20x + 3$$

in the form

$$p(x + q)^2 + r.$$

2. Find

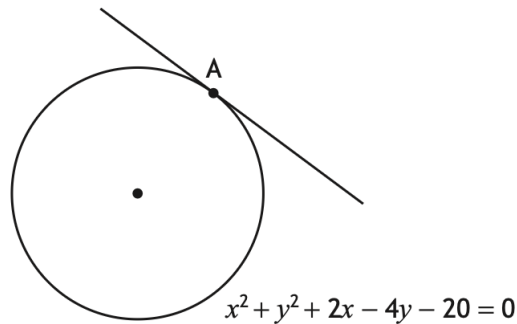
(4)

$$\int \left(15x^{\frac{2}{3}} + \frac{7}{x^2} \right) dx.$$

3. A circle has equation

(4)

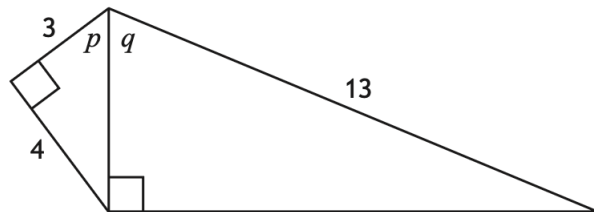
$$x^2 + y^2 + 2x - 4y - 20 = 0.$$



Point $A(2, 6)$ lies on the circle.

Find the equation of the tangent to the circle at A .

4. The diagram shows two right-angled triangles with angles p and q as marked.



(a) Determine the exact value of $\sin q$. (1)

(b) Find the exact value of:

(i) $\sin(p + q)$, (4)

(ii) $\cos(p + q)$. (2)

(c) Hence find the exact value of $\tan(p + q)$. (1)

5. Functions f and g are defined on $\mathbb{R}$, the set of real numbers, by

$$f(x) = 2x^2 + 5 \text{ and } g(x) = x + 3.$$

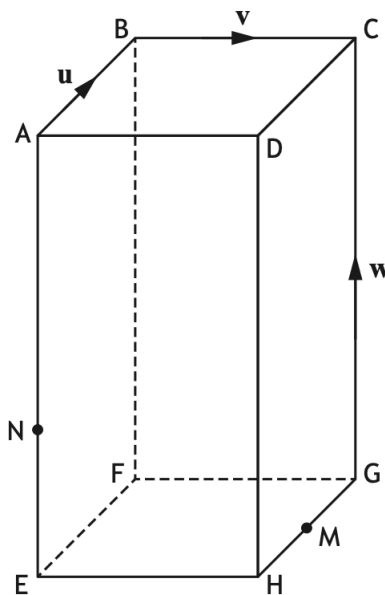
(a) Find an expression for:

(i) $f(g(x))$ and (2)

(ii) $g(f(x))$. (1)

(b) State the range of $g(f(x))$. (1)

6. $ABCDEFGH$ is a cuboid. (2)



- $\overrightarrow{AB} = \mathbf{u}$.
- $\overrightarrow{BC} = \mathbf{v}$.
- $\overrightarrow{GC} = \mathbf{w}$.
- The point M is the mid-point of HG .
- The point N divides EA with the ratio $1 : 2$.

Express the vector $\overrightarrow{MN}$ in terms of $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$.

7. Determine the gradient of the tangent to the curve with equation (4)

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

at the point where $x = 9$.

8. Solve (4)

$$\log_2 x + \log_2(x + 2) = 3,$$

where $x > 0$.

9. (a) Show that the points $D(-1, 6, 1)$, $E(1, 2, 7)$, and $F(2, 0, 10)$ are collinear. (3)

Point G is such that F divides DG in the ratio $3 : 4$.

- (b) Find the coordinates of G . (2)

10. Find (4)

$$\int_{\frac{1}{6}\pi}^{\frac{1}{3}\pi} 6 \sin(3x - \frac{1}{2}\pi) \, dx.$$

11. (a) (i) Show that $(x + 2)$ is a factor (2)

$$x^3 + 7x^2 + 18x + 16.$$

- (ii) Explain why $(x + 2)$ is the only linear factor of (2)

$$x^3 + 7x^2 + 18x + 16.$$

Give a reason for your answer.

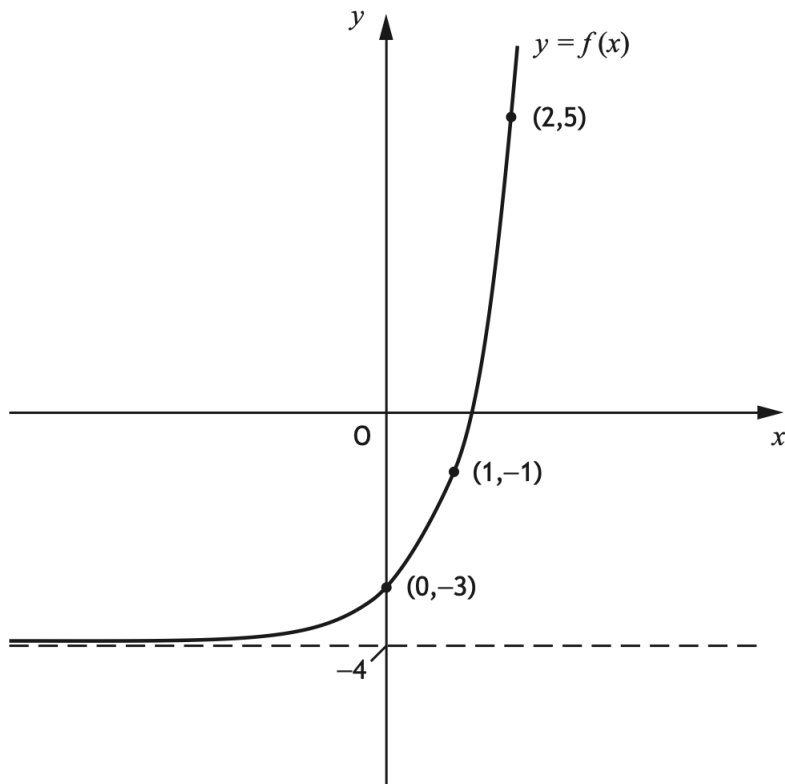
- (b) Find the coordinates of the point(s) where the curves with equations (4)

$$y = 2x^3 + 20x^2 + 27x + 9 \text{ and } y = 6x^2 - 9x - 23$$

intersect.

12. An exponential function, f , is defined for $x \in \mathbb{R}$.

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



The inverse function, $f^{-1}(x)$, exists.

- (a) On the diagram in your answer booklet, sketch the graph of the inverse function. (2)

The inverse function is of the form

$$f^{-1}(x) = \log_a(x + b).$$

- (b) (i) Determine the values of a and b . (2)
(ii) State the domain of the inverse function, $f^{-1}(x)$. (1)