## Core Mathematics C1 Paper C

1. Solve the equation

$$9^x = 3^{x+2}. [3]$$

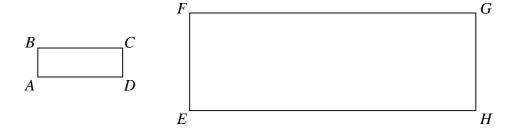
[4]

2. The straight line *l* has the equation x - 5y = 7.

The straight line m is perpendicular to l and passes through the point (-4, 1).

Find an equation for m in the form y = mx + c.

3.



The diagram shows the rectangles *ABCD* and *EFGH* which are similar.

Given that  $AB = (3 - \sqrt{5})$  cm,  $AD = \sqrt{5}$  cm and  $EF = (1 + \sqrt{5})$  cm, find the length EH in cm, giving your answer in the form  $a + b\sqrt{5}$  where a and b are integers. [5]

- **4.** (i) Sketch on the same diagram the curves  $y = x^2 4x$  and  $y = -\frac{1}{x}$ . [4]
  - (ii) State, with a reason, the number of real solutions to the equation

$$x^2 - 4x + \frac{1}{x} = 0. ag{2}$$

5. (i) Solve the inequality

$$x^2 + 3x > 10. ag{3}$$

(ii) Find the set of values of x which satisfy both of the following inequalities:

$$3x - 2 < x + 3$$
$$x^2 + 3x > 10$$
 [3]

**6.** 
$$f(x) = 4x^2 + 12x + 9.$$

- (i) Determine the number of real roots that exist for the equation f(x) = 0. [2]
- (ii) Solve the equation f(x) = 8, giving your answers in the form  $a + b\sqrt{2}$  where a and b are rational. [4]
- 7. The circle C has centre (-1, 6) and radius  $2\sqrt{5}$ .

(i) Find an equation for 
$$C$$
. [2]

The line y = 3x - 1 intersects C at the points A and B.

(ii) Find the x-coordinates of A and B. 
$$[4]$$

(iii) Show that 
$$AB = 2\sqrt{10}$$
. [3]

8. 
$$f(x) = 2 - x + 3x^{\frac{2}{3}}, x > 0.$$

(i) Find 
$$f'(x)$$
 and  $f''(x)$ . [3]

- (ii) Find the coordinates of the turning point of the curve y = f(x). [4]
- (iii) Determine whether the turning point is a maximum or minimum point. [2]
- 9. (i) Find an equation for the tangent to the curve  $y = x^2 + 2$  at the point (1, 3) in the form y = mx + c. [4]
  - (ii) Express  $x^2 6x + 11$  in the form  $(x + a)^2 + b$  where a and b are integers. [2]
  - (iii) Describe fully the transformation that maps the graph of  $y = x^2 + 2$  onto the graph of  $y = x^2 6x + 11$ . [2]
  - (iv) Use your answers to parts (i) and (iii) to deduce an equation for the tangent to the curve  $y = x^2 6x + 11$  at the point with x-coordinate 4. [2]

Turn over

**10.** The curve *C* has the equation y = f(x) where

$$f(x) = (x+2)^3$$
.

- (i) Sketch the curve C, showing the coordinates of any points of intersection with the coordinate axes.
- [3]

(ii) Find f'(x).

[4]

The straight line l is the tangent to C at the point P(-1, 1).

(iii) Find an equation for l.

[3]

The straight line m is parallel to l and is also a tangent to C.

(iv) Show that m has the equation y = 3x + 8.

[4]