

ANSWER ALL QUESTIONS

TIME ALLOWED = 45 MINUTES

This test is marked out of 40 marks. You should show sufficient workings to make your methods clear. Answers without working may not gain full credit. Calculators are permitted in this test.

1 The function f is defined such that

$$f(x) = x^2 - 5x + 4$$

(a) Solve the equation $f(x) = 0$. (2 marks)

(b) Find the minimum value of f and the value of x at which it occurs. (3 marks)

2 The functions f , g and h are defined for positive x such that

$$f(x) = 4x^2 + 5x^{-1} - 2 \quad g(x) = 2x^{-4} - x^2(1-x) \quad h(x) = 4x^3 - 64x$$

(a) Find simplified expressions for

(i) $f(x) + g(x)$ (ii) $2g(x) - 3f(x) + h(x)$ (iii) $f(3x) - f(x) - 4g(x)$

(4 marks)

The curve C has the equation $y = h(x)$.

(b) Write down the value of y when the curve crosses the x axis. (1 mark)

(c) Find the coordinates of intersection the curve C has with the x axis. (4 marks)

3 Express $4x^2 - 6x + 1$ in the form $a(x+b)^2 + c$, where a , b and c are constants to be found.

(4 marks)

4 (a) Expand and simplify $(3x-2)(x-1)(x+2)$.

(3 marks)

(b) Solve the equation $x^2(2x-3) + x^3 = 4(2x-x^2-1)$.

(4 marks)

5 By completing the square on the equation $ax^2 + bx + c = 0$, prove the quadratic formula.

(5 marks)

6 Alex picks a natural number.

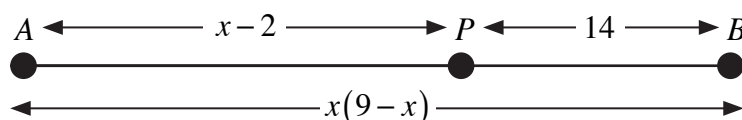
He then adds together the squares of the **next** two consecutive natural numbers.

The total he obtains is 113.

Find the number Alex picked.

(5 marks)

7 Three distinct points A , P and B lie on a straight line, as shown in the diagram below.



All measurements are given in metres.

Find the value of x .

(5 marks)

END OF TEST