

**LC 2015 (SET B): PAPER 1****QUESTION 4 (25 MARKS)****Question 4 (a)**

$$-x^2 + 6x - 4 = 0 \leftarrow \text{Multiply across by } -1.$$

$$\therefore x^2 - 6x + 4 = 0 \leftarrow \text{Write the values of } a, b \text{ and } c.$$

$$a = 1, b = -6, c = 4$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(4)}}{2(1)} = \frac{6 \pm \sqrt{36 - 16}}{2}$$

$$= \frac{6 \pm \sqrt{20}}{2} = \frac{6 \pm 2\sqrt{5}}{2}$$

$$= \frac{6 - 2\sqrt{5}}{2}, \frac{6 + 2\sqrt{5}}{2} \leftarrow \text{Input each fraction into your calculator.}$$

$$\approx 0.8, 5.2$$

**FORMULAE AND TABLES BOOK**  
**Algebra: Roots of the quadratic equation**

$$ax^2 + bx + c = 0 \text{ [page 20]}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**MARKING SCHEME NOTES****Question 4 (a) [Scale 15C (0, 3, 10, 15)]**

- 3:**
- Correct quadratic formula written
  - Attempt at factorising
- 10:**
- Correct substitution into quadratic formula
  - Finds one correct solution
  - Solutions found with not more than 3 errors

**Note:**  $x = 3 + \sqrt{5}$ ,  $x = 3 - \sqrt{5}$  merits 14 marks

**Question 4 (b)**

$$f(x) = -x^2 + 6x - 4 = 0$$

$$f'(x) = -2x + 6$$

$$f'(x) = 0 \Rightarrow -2x + 6 = 0$$

$$6 = 2x$$

$$\therefore x = 3 \leftarrow \text{Put this value into the original function.}$$

$$f(3) = -(3)^2 + 6(3) - 4 = -9 + 18 - 4 = 5$$

Turning point (3, 5)

FIND TURNING POINTS (LOCAL MAXIMUM/MINIMUM)

$$\text{Put } \frac{dy}{dx} = 0 \text{ and solve for } x$$

**FORMULAE AND TABLES BOOK**  
**Calculus: Derivatives [page 25]**

$$y = x^n \Rightarrow \frac{dy}{dx} = nx^{n-1}$$

**MARKING SCHEME NOTES****Question 4 (b) [Scale 5C (0, 3, 4, 5)]**

- 3:**
- Differentiates at least one term correctly
  - States  $f'(x) = 0$  or writes  $f'(x)$  or writes  $\frac{dy}{dx}$
  - Correct answer without work
  - Some work towards a graphical solution
- 4:**
- Finds correct  $x$  value
  - Correct structure to  $f'(x) = 0$ , but with errors and finishes correctly

**Note:** Accept correct turning point found graphically for full marks

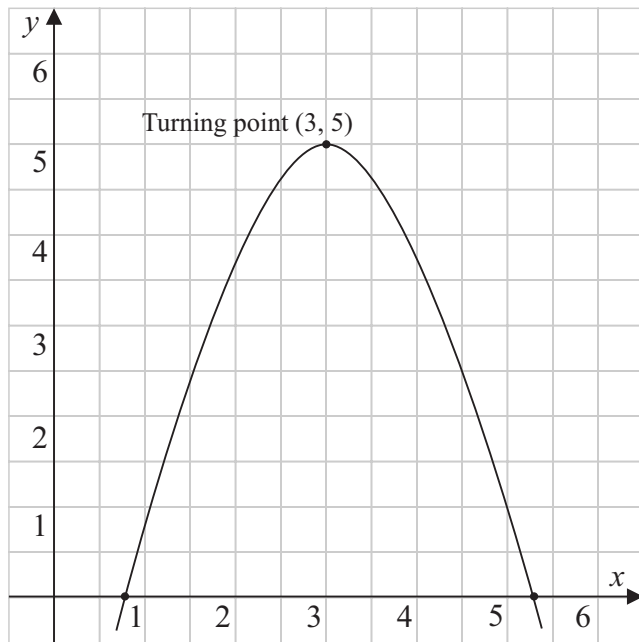
**Question 4 (c)**

$$f(x) = -x^2 + 6x - 4$$

The number in front of  $x^2$  is negative. This means the graph is shaped as shown.

You know the 2 places where  $f(x)$  cuts the  $x$ -axis:  $x = 0.8$  and  $x = 5.2$ .

The turning point is  $(3, 5)$ .



**MARKING SCHEME NOTES**

**Question 4 (c) [Scale 5B (0, 3, 5)]**

- 3:**
- Any correct information shown on graph, e.g. indicates scale
  - General shape of curve drawn