

QUESTION 5 (25 MARKS)

Question 5 (a)

$$x = \sqrt{x+6} \leftarrow \text{Square both sides.}$$

$$x^2 = x + 6$$

$$x^2 - x - 6 = 0 \leftarrow \text{Factorise the quadratic.}$$

$$(x+2)(x-3) = 0$$

$$x = \cancel{-2}, 3$$

$$\therefore x = 3$$

Check each solution:

$$x = -2: \text{LHS: } x = -2$$

$$\text{RHS: } \sqrt{x+6} = \sqrt{-2+6} = \sqrt{4} = 2$$

Therefore, $x = -2$ is not a solution.

$$x = 3: \text{LHS: } x = 3$$

$$\text{RHS: } \sqrt{x+6} = \sqrt{3+6} = \sqrt{9} = 3$$

Therefore, $x = 3$ is a solution.

MARKING SCHEME NOTES

Question 5 (a) [Scale 10C (0, 4, 8, 10)]

4: • Indication of squaring

8: • Correct roots

Note: must indicate required root

Question 5 (b)

$$y = x - \sqrt{x+6} = x - (x+6)^{\frac{1}{2}}$$

$$\frac{dy}{dx} = 1 - \frac{1}{2}(x+6)^{-\frac{1}{2}} = 1 - \frac{1}{2\sqrt{x+6}}$$

FORMULAE AND TABLES BOOK

Calculus: Derivatives [page 25]

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

$$y = [f(x)]^n \Rightarrow \frac{dy}{dx} = n[f(x)]^{n-1} \times f'(x)$$

MARKING SCHEME NOTES

Question 5 (b) [Scale 5B (0, 2, 5)]

2: • Any correct differentiation

• Indication of $(x+6)^{\frac{3}{2}}$

Question 5 (c)

$$\frac{dy}{dx} = 0 \Rightarrow 1 - \frac{1}{2\sqrt{x+6}} = 0$$

$$1 = \frac{1}{2\sqrt{x+6}}$$

$$2\sqrt{x+6} = 1 \leftarrow \text{Square both sides.}$$

$$4(x+6) = 1$$

$$4x + 24 = 1$$

$$4x = -23$$

$$x = -\frac{23}{4}$$

$$x = -\frac{23}{4} : y = x - \sqrt{x+6} = -\frac{23}{4} - \sqrt{-\frac{23}{4} + 6} = -\frac{23}{4} - \sqrt{\frac{1}{4}} = -\frac{23}{4} - \frac{1}{2} = -\frac{25}{4}$$

Turning point $(-\frac{23}{4}, -\frac{25}{4})$

FIND TURNING POINTS (LOCAL MAXIMUM/MINIMUM)
Put $\frac{dy}{dx} = 0$ and solve for x

MARKING SCHEME NOTES

Question 5 (c) [Scale 10C (0, 4, 8, 10)]

4: • Differentiation equals 0

8: • Finds x value

Note 1: A linear equation from $f'(x)$ gets low partial at most

Note 2: Must put $f'(x) = 0$ in (c) to get any marks

Note 3: $f'(x)$ only and $f''(x)$ only: no credit