

Worked Solutions

AQA C2 Paper C

1. $1 + 6(-2x) + \frac{6 \cdot 5}{2}(-2x)^2 + \frac{6 \cdot 5 \cdot 4}{3 \cdot 2}(-2x)^3 = 1 - 12x + 60x^2 - 160x^3$ (4 marks)

2. $f'(x) = 4 - \frac{1}{x^2}$

$f(x)$ is increasing for $f'(x) > 0$

$$4 - \frac{1}{x^2} > 0, \quad 4 > \frac{1}{x^2}$$

$$x^2 > \frac{1}{4} \quad (x^2 > 0)$$

solution set is $x > \frac{1}{2}$ (given $x > 0$) (5 marks)

3. (a) $r = \frac{3645}{10935} = \frac{1}{3}$

11th term = $ar^{10} = 10935 \times \left(\frac{1}{3}\right)^{10} = \frac{5}{27}$ (2 marks)

(b) $S_9 = \frac{10935 \left[1 - \left(\frac{1}{3}\right)^9\right]}{1 - \frac{1}{3}} = 16401.67$ (2 marks)

(c) $S_\infty = \frac{10935}{1 - \frac{1}{3}} = 16402.5$. (1 mark)

4. (a) $\frac{x^{\frac{5}{2}}}{x^2} + \frac{1}{x^2} = x^{\frac{1}{2}} + x^{-2}$ (2 marks)

(b) $\int_1^4 (x^{\frac{1}{2}} + x^{-2}) dx = \left[\frac{2}{3}x^{\frac{3}{2}} - \frac{1}{x} \right]_1^4 = \frac{65}{12}$ (5 marks)

5. (a) (i) $\log_3 a^4 = 4 \log_3 a$ (1 mark)

(ii) $\log_3 9 + \log_3 a^2 = 2 + 2 \log_3 a$ (3 marks)

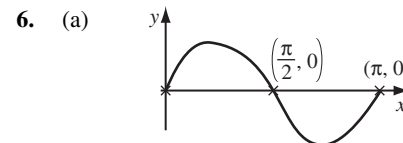
(b) $b^2 = 8$

$$\log_2 b^2 = \log_2 8 = \log_2 2^3$$

$$2 \log_2 b = 3 \log_2 2 \quad (\log_2 2 = 1)$$

$$2 \log_2 b = 3$$

$$\log_2 b = \frac{3}{2}$$
 (3 marks)



(4 marks)

(b) $\sin 2x = \frac{1}{2} \Rightarrow 2x = \frac{\pi}{6}, \frac{5\pi}{6}$

$$x = \frac{\pi}{12}, \frac{5\pi}{12}$$
 (4 marks)

7. (a) $4x - 9 - x = 5x - (4x - 9)$

$$x = 9$$
 (2 marks)

(b) second term = $4 \times 9 - 9 = 27$

common difference = $27 - 9 = 18$

51st term = $9 + (51 - 1) \times 18 = 909$ (3 marks)

(c) $S_n = \frac{n}{2} [18 + (n - 1) \times 18] = 9n^2$ (4 marks)

8. (a) $(x + 2)^2 = (x + 3)^2 + x^2 - 2(x + 3)x \cdot \frac{1}{2}$

$$x = 5$$

(5 marks)

(b) $\text{area} = \frac{1}{2} \cdot x(x + 3) \sin 60^\circ = \frac{1}{2} \cdot 5 \cdot 8 \cdot \frac{\sqrt{3}}{2} = 10\sqrt{3}$

(4 marks)

9. (a) (i) $\frac{dy}{dx} = \frac{1}{4} - \frac{4}{x^2}$

(2 marks)

(ii) $y = x^3 - 4x^2, \frac{dy}{dx} = 3x^2 - 8x$

(3 marks)

(iii) $y = 2x^{\frac{1}{2}} + \sqrt{2}, \frac{dy}{dx} = 2 \times \frac{1}{2}x^{-\frac{1}{2}} = x^{-\frac{1}{2}}$

(2 marks)

(b) $y = 3x + x^{-2}$

$$\frac{dy}{dx} = 3 - 2x^{-3}$$

$$3 - \frac{2}{x^3} = 1$$

$$x^3 = 1$$

$$x = 1$$

when $x = 1, y = 4$

(4 marks)

10. (a) $m = 4$

(1 mark)

(b) $2^{2n} = (2^3)^{3-n}$

$$2^{2n} = 2^{9-3n}$$

$$2n = 9 - 3n$$

$$n = \frac{9}{5}$$

(4 marks)

(c) (i) $u^{\frac{1}{4}} = y$

equation is $y = 2 + \frac{3}{y}$

$$y^2 = 2y + 3$$

$$y^2 - 2y - 3 = 0$$

(3 marks)

(ii) $(y - 3)(y + 1) = 0$

$y = 3$ or $y = -1$ (not possible)

$$u^{\frac{1}{4}} = 3 \Rightarrow u = 81$$

(2 marks)