

Mark Scheme

Section A

| | | | | |
|---------------------|---|--------------------------|--|----------------------|
| 1 | $6x^5 + \frac{1}{2}x^{-\frac{1}{2}}$ o.e. | B1 B1 B1 | $6x^5$ $x^{\frac{1}{2}}$ soi $\frac{1}{2}x^{-\frac{1}{2}}$ isw | 3 |
| 2 | $\frac{x^4/4}{\frac{x^{-2}}{-2}}$ c | B1 B2 B1 | B1 for kx^{-2} | 4 |
| 3 | At least 1 period of sine curve Sine curve from 0 to 360 191.537 rot to 3 or more sf 348.463 rot to 3 or more sf | G1 G1 B1 B1 | ± 1 indicated After B1 B1, -1 for extras in the range SC1 for 192.8 and 347.2 (grads) SC1 for 180.2 and 359.8 (radians) | 4 |
| 4 | 9.0 or 8.96 or 8.960 13.2577 | B3 B2 | M1 for [$BC^2 =]6.8^2 + 4.1^2 - 2 \times 4.1 \times 6.8 \times \cos 108$ A1 for 80.2(8.), 8.37(grads), 6.49 (rads) Correctly rounded to 3 or more sf M1 for $0.5 \times 4.1 \times 6.8 \times \sin 108$ For complete long methods using BC, allow M1 and A1 for 13.2 to 13.3 | 5 [16] |
| 5 | $a = 4, r = 1/2$ identified 2^{-17} 8 | B1 T2 S2 | Stated or identified by correct use M1 20^{th} term = their(a)x(their r) ¹⁹ M1 $S = \text{their}(a) / (1 - \text{their}(r))$ | 5 |
| 6 | 4, 7, 10, 13, 16 ignore extras 15250 | B1 B4 | For showing 1 st four or 2 nd four terms B1 for $d = 3$ soi B1 for $a = 4$ soi M1 for use of $100/2[2a + 99d]$ o.e. | 5 |
| 7 | (i) 2.4, $2\frac{2}{5}, \frac{12}{5}$ (ii) 22 | B3 P2 | M1 for $30 = \frac{1}{2} \times 25 \times q$ o.e. M1 for $q = (2 \times 30) / 5^2$ M1 for (arc =)5 x their 2.4 | 5 |
| 8 | (i) 2.5, 2.50, 2.500, 2.499.. (ii) 6 www | B2 B3 | M1 for $\log_{10} 316$ or $\ln 316 / \ln 10$ B2 for $6 \log_a a$ or $\log_a(a^6)$ Or B1 for $2 \log_a(a)$ or $-\log_a a^{-4}$ SC1 Using $a=10 \Rightarrow 6$ SC2 Using numerical a, not $10 \Rightarrow 6$ | 5 [20] |
| Total for section A | | | | 36 |

Section B

| | | | | | |
|-----------|------------|---|----------------------------------|---|------|
| 9 | iA | 6.25 | B2 | M1 for $x = 5$ used to find y | 2 |
| | iB | (V =) area of cross-section \times length $(\frac{100}{4})[\frac{10}{2}x^2 - \frac{1}{3}x^3]$ o.e. [val at $x = 10$] – [val at $x = 0$] 4166 to 4167 or 4170 | E1 M1 M1 | Subs of correct limits into their integrand | |
| | ii | 52.62 | B4 | M3 for- $2/2 \times [2.15x^2 + 2(5.64x^2 + 6.44x^2)]$ oe Or M2 if one slip Or M1 if 2 slips or one trap evaluated | 5 |
| | | Their(5262) – their (4167) | M1 | Must be >0 | [12] |
| 10 | i | $y' = 3x^2 - 12x$ use of $y' = 0$ $x = 0$ and 4 (0, 12) and (4, -20) | B1B1 M1 A1 A1 | Allow $y = 12$ and $y = -20$ | 7 |
| | ii | $y'' = 6x - 12$ used max when $x = 0$, min when $x = 4$ when $x = 2$ $y' = -12$ grad of normal = $1/12$ | M1 A1 B1 B1ft | y' used each side of TP or good sketch Both stated, only one needs testing from their y' | |
| | | $y + 4 = 1/12(x - 2)$ | M1ft | accept any numerical m Or $-4 = \text{their}(m) \times 2 + c$ | 4 |
| | | $y = \frac{1}{12}x - 4\frac{1}{6}$ | A1 | Any recognisable $25/6$, at worst 4.1 | [11] |
| 11 | i | Excess temperature At $t = 0$ oe | B1 B1 | | 2 |
| | ii | $\log z = \log z_0 + \log(10^{-kt})$ $= \log z_0 - kt \log 10$ | B1 B1 | nb AG | 2 |
| | iii | Z = 46 31 20 14 9 $\log z : 1.66 \ 1.49 \ 1.30 \ 1.15 \ 0.95$ correctly plotted line of best fit $k = 0.017$ to 0.019 or 0.02 $z_0 = 66$ to 73 temp of drink = 25 to 27 | T1 P1 L1 G2 B2 C2 | If $z = 68, 53 \dots$ P1, L1, M1, M1, M1 available fit their values, within 2mm Ruled, using their points M1 for attempting +/- gradient M1 for $(\log) z_0 = 1.82$ to 1.86 M1 3 to 5 or their $69 \times 10^{-70 \times \text{their } k}$ | 9 |
| | | | | | [13] |