| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 10(a) | $y = \frac{30}{x^2}$ oe | **B1** | |
| | $S = \pi x\sqrt{x^2 + \left(their\ \frac{30}{x^2}\right)^2}$ | **M1** | **FT** *their* $y = \frac{30}{x^2}$ providing $10\pi = \frac{1}{3}\pi x^2 y$ was attempted |
| | Correct completion to given answer $S = \frac{\pi\sqrt{x^6 + 900}}{x}$ | **A1** | |
| 10(b) | $\frac{\mathrm{d}([\pi]\sqrt{x^6 + 900})}{\mathrm{d}x} = [\pi\times]\frac{1}{2}(x^6 + 900)^{-\frac{1}{2}} \times 6x^5$ | **B2** | **B1** for $[\pi\times]\, kx^5(x^6 + 900)^{-\frac{1}{2}}$, $k \neq 3$ or 0 |
| | Applies correct form of quotient or product rule e.g.: $\frac{\pi x\left(3x^5(x^6 + 900)^{-\frac{1}{2}}\right) - \pi(x^6 + 900)^{\frac{1}{2}}}{x^2}$ or $-\pi x^{-2}(x^6 + 900)^{\frac{1}{2}} + \frac{\pi}{x}\left(3x^5(x^6 + 900)^{-\frac{1}{2}}\right)$ | **M1** | **FT** *their* $\frac{\mathrm{d}([\pi]\sqrt{x^6 + 900})}{\mathrm{d}x}$ |
| | *their* $\frac{\mathrm{d}S}{\mathrm{d}x} = 0$ and attempt to solve | **M1** | **DEP** |
| | $x = \sqrt[6]{450}$ isw | **A1** | |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 11(a)(i) | $\frac{1}{q}-\frac{1}{p}=-\frac{1}{q}-\frac{1}{q}$ oe<br>or $-\frac{1}{p}-(3-1)d=\frac{1}{p}+(2-1)d$<br>or $\frac{1}{p}=\frac{3}{2}\left\{\frac{2}{p}+(3-1)d\right\}$ | **M2** | **M1** for $[d=]\frac{1}{q}-\frac{1}{p}$ or $[d=]-\frac{1}{q}-\frac{1}{q}$<br>or $[2d=]-\frac{1}{q}-\frac{1}{p}$ or $-\frac{1}{q}=\frac{1}{p}+(3-1)d$<br>or $\frac{1}{q}=\frac{1}{p}+(2-1)d$<br>or $\frac{1}{p}+\frac{1}{q}-\frac{1}{q}=\frac{3}{2}\left\{\frac{2}{p}+(3-1)d\right\}$ |
| | correct completion to given answer $-\frac{2}{3p}$<br>e.g. $-\frac{1}{3p}-\frac{1}{3p}=-\frac{2}{3p}$<br>or $\frac{1}{3p}-\frac{1}{p}=\frac{1}{3p}-\frac{3}{3p}=-\frac{2}{3p}$<br>or makes $d$ the subject of<br>$-\frac{1}{p}-(3-1)d=\frac{1}{p}+(2-1)d$<br>or $\frac{1}{p}=\frac{3}{2}\left\{\frac{2}{p}+(3-1)d\right\}$ | **A1** | |
| 11(a)(ii) | $\left[u_{10}\text{oe or } \frac{k}{p}=\right]\frac{1}{p}+9\left(\frac{-2}{3p}\right)$ | **M1** | |
| | $k=-5$ | **A1** | |