| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 6(a) | Expands to obtain the first two terms<br>Can be unsimplified<br>Condone sign error | 1.1a | M1 | $\left(1-\frac{x}{2}\right)^{\frac{1}{2}} \approx 1+\left(\frac{1}{2}\right)\left(-\frac{x}{2}\right)$ |
| | Obtains $1-\frac{1}{4}x$ OE<br>Accept if listed as two separate terms. Ignore any extra terms | 1.1b | A1 | $\approx 1-\frac{1}{4}x$ |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 6(b) | States or uses at least one small angle approximation correctly either<br>$\sin kx \approx kx$ or $\sqrt{\cos x} \approx \sqrt{1-\frac{x^2}{2}}$ | 3.1a | M1 | $\sin(4x)+\sqrt{\cos x} \approx 4x+\sqrt{1-\frac{x^2}{2}}$<br>$\approx 4x+\left(1-\frac{x^2}{4}\right)$<br>$\approx 1+4x-\frac{1}{4}x^2$ |
| | Uses both small angle approximations correctly for sine and cosine<br>$\sin kx \approx kx$ and $\sqrt{\cos x} \approx \sqrt{1-\frac{x^2}{2}}$<br>Must have eliminated all trig expressions<br>Inconsistent variables for angles must eventually be consistent to be awarded A1 | 1.1b | A1 | |
| | Uses their expansion from **(a)**<br>Must have replaced $x$ with $x^2$<br>or<br>Applies binomial theorem correctly to $\left(1-\frac{x^2}{2}\right)^{\frac{1}{2}}$ ignore any extra terms | 3.1a | M1 | |
| | Completes argument to obtain $4x+\left(1-\frac{x^2}{4}\right)$ or $1+4x-\frac{1}{4}x^2$<br>Accept any order of terms<br>Ignore higher powers of $x$<br>Must be in terms of $x$<br>Do not ISW | 2.1 | R1 | |
| | **Subtotal** | | **4** | |

| | | | | |
|---|---|---|---|---|
| | **Question 6 Total** | | **6** | |