Part (b)

| | | |
|---|---|---|
| **(b)** | E.g. $(-3,7)+(3,-9)=...$ or $(12,2)-(12,4)=...$ | M1 |
| | $(0,-2)$ | A1 |
| | | **(2)** |
| **ALT 1** | grad $PQ = \frac{11-7}{9--3}=\frac{1}{3}\Rightarrow$ eqn $RS$ is $y-2=\frac{1}{3}(x-12)$<br>grad $QR = \frac{11-2}{9-12}=-3\Rightarrow$ eqn $PS$ is $y-7=-3(x+3)$<br>$\Rightarrow x=..., y=...$ | M1 |
| | $(0,-2)$ | A1 |
| **ALT 2** | Midpoint $PR$ is $\left(\frac{9}{2},\frac{9}{2}\right)\Rightarrow \frac{9+x}{2}=\frac{9}{2}, \frac{11+y}{2}=\frac{9}{2}\Rightarrow x=.., y=...$ | M1 |
| | $(0,-2)$ | A1 |
| | | **(5 marks)** |

(b)

**M1:** Any suitable method of finding at least $x$ or $y$ for $S$. It can be implied by one correct coordinate which may be seen on a diagram.
e.g. Via vectors $(-3,7)+(3,-9)=(0,-2)$ or $(12,2)-(12,4)=(0,-2)$

**A1:** Correct coordinates $(0,-2)$ which may be written separately e.g. $x = 0$, $y = -2$ or as $\begin{pmatrix}0\\-2\end{pmatrix}$

**Alt 1(b)**

**M1:** Attempts the equation of line $PS$, the equation of line $RS$ and solves simultaneously to find $x$ or $y$

**A1:** Correct coordinates $(0,-2)$ which may be written separately e.g. $x = 0$, $y = -2$ or as $\begin{pmatrix}0\\-2\end{pmatrix}$

**Alt 2(b)**

**M1:** Attempts the midpoint of $PR$ and uses $Q$ to find $S$ for at least one of $x$ or $y$

**A1:** Correct coordinates $(0,-2)$ which may be written separately e.g. $x = 0$, $y = -2$ or as $\begin{pmatrix}0\\-2\end{pmatrix}$

| Question Number | Scheme | Marks |
|---|---|---|
| **3** | $\int \frac{4x^5+3}{2x^2}\,\mathrm{d}x = \int 2x^3+\frac{3}{2}x^{-2}\,\mathrm{d}x$ | M1 A1 |
| | $=\frac{1}{2}x^4-\frac{3}{2}x^{-1}+c$ | dM1 A1 A1 |
| | | **(5)** |
| | | **(5 marks)** |

**M1**: Attempts to write as **a sum of two terms** with one processed index correct.

Award for $Px^3+Qx^k$ or $Px^k+Qx^{-2}$ or $Px^k+\frac{Q}{x^2}$ where $k$ could be 0 i.e. a constant term.

**A1:** Correct integrand written as a sum of two terms with indices processed. E.g. $2x^3+\frac{3}{2}x^{-2}$ seen in one expression.

Award for any exact equivalent such as $\frac{1}{2}\left(4x^3+\frac{3}{x^2}\right)$ or e.g. $\frac{4}{2}x^3+\frac{3}{2x^2}$ or e.g. $\frac{4x^3+3x^{-2}}{2}$

**dM1:** Attempts to integrate an expression of the form $Px^m+Qx^n$, $m=3$ or $n=-2$, raising one of the indices by one. Depends on the first M mark.

**A1:** Either term correct and simplified and from correct work: $\frac{1}{2}x^4+Ax^n\left(+c\right)$ or $Bx^m-\frac{3}{2}x^{-1}\left(+c\right)$

**A1:** $\frac{1}{2}x^4-\frac{3}{2}x^{-1}+c$. Allow simplified equivalents e.g. $\frac{1}{2}x^4-\frac{3}{2x}+c$, $0.5x^4-1.5x^{-1}+c$ but **not** e.g. $\frac{1}{2}x^4-\frac{\frac{3}{2}}{x}+c$ and **not** $\frac{1}{2}x^4+-\frac{3}{2}x^{-1}+c$.

Condone poor notation such as $\int \frac{1}{2}x^4-\frac{3}{2x}+c\left(\mathrm{d}x\right)$, $y=\frac{1}{2}x^4-\frac{3}{2x}+c$

You can ignore subsequent working if necessary e.g. award the marks once a correct answer is seen as a correct single expression.

Correct answer only scores full marks.