A1: $72+36\ln 2$ or $36\ln 2+72$

(ii) Condone missing dx's here

M1: Attempts to integrate by parts $\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = A\mathrm{e}^{x}\sin 2x \pm \int B\mathrm{e}^{x}\sin 2x\,\mathrm{d}x$

A1: $\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = \frac{3}{2}\mathrm{e}^{x}\sin 2x - \int \frac{3}{2}\mathrm{e}^{x}\sin 2x\,\mathrm{d}x$ Condone missing dx's

The 3 may have been "removed"/factorised out and replaced at the final answer.
If so you can this would be awarded at the sight of a correct answer.

dM1: Attempts to integrate by parts again. See below of what to look for

Look for $\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = A\mathrm{e}^{x}\sin 2x \pm B\mathrm{e}^{x}\cos 2x \pm \int C\,\mathrm{e}^{x}\cos 2x\,\mathrm{d}x$

ddM1: Dependent upon both previous M's

It is awarded for attempting to collect both terms in $\int \mathrm{e}^{x}\cos 2x\,\mathrm{d}x$

A1: $\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = \frac{6}{5}\mathrm{e}^{x}\sin 2x + \frac{3}{5}\mathrm{e}^{x}\cos 2x\left(+c\right)$ condone the omission of the + c.

Alternative method for (ii) . This can be scored in a similar way to the above.

(ii)	$\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = 3\mathrm{e}^{x}\cos 2x + \int 6\mathrm{e}^{x}\sin 2x\,\mathrm{d}x$	M1 A1
	$= 3\mathrm{e}^{x}\cos 2x + 6\mathrm{e}^{x}\sin 2x - \int 12\mathrm{e}^{x}\cos 2x\,\mathrm{d}x$	dM1
	$15\int \mathrm{e}^{x}\cos 2x\,\mathrm{d}x = 6\mathrm{e}^{x}\sin 2x + 3\mathrm{e}^{x}\cos 2x$	ddM1
	$\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = \frac{6}{5}\mathrm{e}^{x}\sin 2x + \frac{3}{5}\mathrm{e}^{x}\cos 2x\left(+c\right)$	A1
		(5)

1stM1: $\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = P\mathrm{e}^{x}\cos 2x \pm Q\int \mathrm{e}^{x}\sin 2x\,\mathrm{d}x$

2ndM1: $\int 3\mathrm{e}^{x}\cos 2x\,\mathrm{d}x = P\mathrm{e}^{x}\cos 2x \pm Q\mathrm{e}^{x}\sin 2x \pm R\int \mathrm{e}^{x}\cos 2x\,\mathrm{d}x$

Question Number	Scheme	Marks
8	Solves one of $\left(3x-y\right)=25$ and $\left(x+y\right)=1$ or $\left(3x-y\right)=5$ and $\left(x+y\right)=5$	M1
	Correct solution of one. Either $\left.\begin{matrix}3x-y=25\\x+y=1\end{matrix}\right\}\Rightarrow 4x=26\Rightarrow x=6.5,\left(y=-5.5\right)$	A1
	Or $\left.\begin{matrix}3x-y=5\\x+y=5\end{matrix}\right\}\Rightarrow 4x=10\Rightarrow x=2.5,\left(y=2.5\right)$	
	Solves both equations	dM1
	Both solved correctly with a minimal reason given for the contradiction e.g "not integers" with conclusion "hence there are no integers x and y such that $3x^2+2xy-y^2=25$"	A1
		(4)

Notes

M1: Attempts to solve one of the two possible cases.

Take as a minimum, one correct pair of equations followed by a value for x or a value for y

A1: Correctly solves one of the two possible cases.

To solve you need only find a value for x or y. Once a correct value is found you can ISW

dM1: Attempts to solve both possible cases

A1: Correctly solves the two possible cases and makes a concluding argument.

To score this mark (i) **all** calculations must be correct.

(ii) reason(s) for the contradiction must be written down. Allow "not integers", "×"

and (iii) gives a concluding statement must be given. Allow for example " hence proven"

Ignore any possible cases which would give rise to negative numbers but satisfy $\left(3x-y\right)\left(x+y\right)=25$

E.g $\left(3x-y\right)=-5,\left(x+y\right)=-5$

Withhold the final mark only if they include cases which do not satisfy $\left(3x-y\right)\left(x+y\right)=25$

E.g $\left(3x-y\right)=20,\left(x+y\right)=5$