| Question | Answer | Marks | Guidance |
|---|---|---|---|
| (a) | Correct separation of variables | B1 | $\int e^{-y}\mathrm{d}y = \int xe^{-x}\mathrm{d}x$   Condone missing integral signs. |
| | Obtain term $-e^{-y}$ | B1 | |
| | Commence integration by parts and reach $\pm xe^{-x} \pm \int e^{-x}\,\mathrm{d}x$ | *M1 | M0 if clearly using differentiation of a product. |
| | Complete integration and obtain $-xe^{-x} - e^{-x}$ | A1 | |
| | Use $x = 0$ and $y = 0$ to evaluate a constant or as limits in a solution containing or derived from terms $ae^{-y}, bxe^{-x}$ and $ce^{-x}$, where $abc \neq 0$ | DM1 | Must see working for this. In a correct solution they should have $-e^{-y} + C = -xe^{-x} - e^{-x}$ or equivalent. If they take logarithms before finding the constant, the constant must be of the right form. |
| | Correct solution in any form<br>Must follow from correct working | A1 | e.g. $-e^{-y} = -xe^{-x} - e^{-x}$<br>A0 if constant of integration ignored or assumed to be zero. |
| | Obtain final answer $y = -\ln\left((x+1)e^{-x}\right)$  from correct working | A1 | OE e.g. $y = x - \ln(x+1)$, $y = \ln\left(\dfrac{e^x}{x+1}\right)$.<br><br>A0 if constant of integration ignored or assumed to be zero. |
| | | 7 | |
| (b) | Obtain answer $(y=)1 - \ln 2$ | B1 | Must follow from at least 6 or7 obtained in part **6(a).** |
| | | 1 | |