№ - 3

$$e^{-s}\left(1+\frac{ds}{dt}\right)=1$$

$$1+\frac{ds}{dt}=e^{s}$$

$$ds=\left(e^{s}-1\right)dt$$

$$\frac{ds}{e^{s}-1}=dt$$

$$\int\frac{ds}{e^{s}-1}=\left\{\begin{matrix}u=e^{s}\\du=u\,ds\end{matrix}\right\}=\int\frac{du}{(u-1)u}=\int\frac{du}{u-1}=$$

$$=\int\frac{du}{u}=\ln(u-1)=\ln(u)=\ln(e^{s}-1)=s$$

② $\int ds = t$

$\Rightarrow \ln(e^s - 1) - s = t$

$\ln(e^s - 1) = s + t$

$e^s - 1 = e^{s+t}$

$e^s(1 - e^t) = 1$

$e^s = \frac{1}{1-e^t} \Rightarrow s = \ln\left(\frac{1}{1-e^t}\right)$

Проверка: $1 + \frac{ds}{dt} = e^s \Rightarrow 1 + \frac{e^t}{1-e^t} = \frac{1}{1-e^t}$ (верно)