$\mathbf{a}(t) = 19t\,\mathbf{i} + e^t\,\mathbf{j} + e^{-t}\,\mathbf{k} \quad \Rightarrow$

$\mathbf{v}\,(t) = \int (19t\,\mathbf{i} + e^t\,\mathbf{j} + e^{-t}\,\mathbf{k})\,dt = \frac{19}{2}t^2\,\mathbf{i} + e^t\,\mathbf{j} - e^{-t}\,\mathbf{k} + \mathbf{C}$

and $\mathbf{k} = \mathbf{v}\,(0) = \mathbf{j} - \mathbf{k} + \mathbf{C}$, so $\mathbf{C} = -\mathbf{j} + 2\,\mathbf{k}$

and $\mathbf{v}(t) = \frac{19}{2}t^2\,\mathbf{i} + (e^t - 1)\,\mathbf{j} + (2 - e^{-t})\,\mathbf{k}$.

$$\begin{aligned} \mathbf{r}(t) &= \int \left[\tfrac{19}{2}t^2\,\mathbf{i} + (e^t - 1)\,\mathbf{j} + (2 - e^{-t})\,\mathbf{k}\right] dt \\ &= \tfrac{19}{6}t^3\,\mathbf{i} + (e^t - t)\,\mathbf{j} + (e^{-t} + 2t)\,\mathbf{k} + \mathbf{D} \end{aligned}$$

But $\mathbf{j} + \mathbf{k} = \mathbf{r}(0) = \mathbf{j} + \mathbf{k} + \mathbf{D}$ , so $\mathbf{D} = \mathbf{0}$ and $\mathbf{r}(t) = \frac{19}{6}t^3\,\mathbf{i} + (e^t - t)\,\mathbf{j} + (e^{-t} + 2t)\,\mathbf{k}$.