SOLUTION of (6-5.b):

By the product rule and using the fact that $\vec{Y}$ is a solution of the IVP we obtain

$$\begin{aligned}
\frac{d}{dt}(\mathbf{Y}^\top(t)\mathbf{Y}(t)) =& \frac{d}{dt}(\mathbf{Y}^\top(t))\mathbf{Y}(t) + \mathbf{Y}^\top(t)\frac{d}{dt}(\mathbf{Y}(t)) \\
=& (-(\mathbf{Y}(t) - \mathbf{Y}^\top(t))\mathbf{Y}(t))^\top \mathbf{Y}(t) + \mathbf{Y}^\top(t)(-(\mathbf{Y}(t) - \mathbf{Y}^\top(t))\mathbf{Y}(t)) \\
=& -\mathbf{Y}^\top(t)\mathbf{Y}^\top(t)\mathbf{Y}(t) + \mathbf{Y}^\top\mathbf{Y}(t)\mathbf{Y}(t) \\
& - \mathbf{Y}^\top\mathbf{Y}(t)\mathbf{Y}(t) + \mathbf{Y}^\top(t)\mathbf{Y}^\top(t)\mathbf{Y}(t) = 0.
\end{aligned}$$

implying that the map is constant.