③ $g = d\vartheta^2 + \sin^2\vartheta \, d\varphi^2$

$\mathcal{L}_X g = ?$ $\quad X = -\sin\varphi \frac{\partial}{\partial\vartheta} - \cos\varphi \cot\vartheta \frac{\partial}{\partial\varphi}$

$\mathcal{L}_Y g = ?$ $\quad Y = \cos\varphi \frac{\partial}{\partial\vartheta} - \sin\varphi \cot\vartheta \frac{\partial}{\partial\varphi}$

$\mathcal{L}_Z g = ?$ $\quad Z = \frac{\partial}{\partial\varphi}$