SAMPLE EXAM QUESTIONS
MTH 420

1. Suppose $d\alpha = \beta$. Find $d(\alpha \wedge \beta)$.

2. Consider 2-dimensional Minkowski space, i.e. $\mathbb{R}^2$ with coordinates (t, x), inner product

$$g(dt, dt) = -1 \qquad g(dt, dx) = 0 \qquad g(dx, dx) = 1$$

and orientation $\omega = dx \wedge dt$. Find the Laplacian $\triangle f = *d*df$ of a function f.

3. Calculate the curl $\nabla \times F = *dF$ of a vector field F in (Euclidean) $\mathbb{R}^3$ using the **orthonormal** spherical basis $\{dr, r\,d\theta, r\sin\theta\, d\phi\}$.