

MA3402 HOMEWORK

Homeworks are intended as quick exercises to help solidify key ideas from the previous week. If you are spending a long time on them, stop and talk it over with someone.

1. HOMEWORK 6

Let $F: N \rightarrow M$ be a smooth map.

- (1) For any forms ω, τ on M , show that $F^*(\omega \wedge \tau) = F^*(\omega) \wedge F^*(\tau)$.
- (2) Read Section 19.3 about existence of an exterior derivative on a manifold.
- (3) Let $\omega \in \Omega^k(M)$. Show $dF^*(\omega) = F^*(d\omega)$. (Hint: we have already shown this is true when $k = 0$.)
- (4) Assume a k -form ω on M is smooth. Show that $F^*(\omega)$ is also smooth.
- (5) Problems 19.1, 19.2 in Tu: more practice explicitly calculating pullbacks.
- (6) Problem 19.13 in Tu: relating forms to Maxwell's Equations!