Math 642

Week 2 Exercises

- Boothby pg. 183 #5: Determine the subset of $\mathbb{R}^2$ on which $\sigma_1 = x\ dx + y\ dy$ and $\sigma_2 = y\ dx + x\ dy$ are linearly independent and find a frame field dual to σ_1, σ_2 on this set.
- Boothby pg. 183 #6: Show that the restriction of $\sigma = x\ dy - y\ dx + z\ dw - w\ dz$ from $\mathbb{R}^4$ to the sphere S^3 is never zero on S^3.
- Lee Ch 2 Problem 13 (Hessian). Remark: When $df = 0$, f has a critical point, the 'second derivative test' determines the behavior near the critical point using the eigenvalues of the Hessian. For example, in $\mathbb{R}^2$, try the functions $x^2 + y^2$, $x^2 - y^2$, $-x^2 - y^2$, and xy at the origin.
- Lee Ch 2 Problem 17 (Test for coordinate charts).