1. Exercise 4.1.2 from Pressley.

2. Show that the antipodal map $A : S^2 \to S^2$ of the unit sphere $S^2$ defined by

$$A(x, y, z) = (-x, -y, -z)$$

is a diffeomorphism.

3. Show that the paraboloid $P : z = x^2 + y^2$ is diffeomorphic to $\mathbb{R}^2$.

4. Determine the tangent planes to the surface $x^2 + y^2 - z^2 = 1$ at the points $(x, y, 0)$ and show that they are all parallel to the $z$-axis.

5. Show that the normals to the surface $S$ parametrized by

$$\sigma(u, v) = (f(u) \cos v, f(u) \sin v, g(u)),$$

where $f(u) \neq 0$, $g'(u) \neq 0$, for all $u$, all pass through the $z$-axis.