Problems are typically taken from either Jeffrey Lee's text *Manifolds and Differential Geometry* (MDG) or John Lee's text *Smooth Manifolds* (SM). I've also written a few problems. 5pts per problem here.

Problem 27 Let $F(x, y, z) = (x^2 - y^2 + z^2, y + z, x + 2y + z)$ define a map on $\mathbb{R}^3$. Where is this map a local diffeomorphism ?

Problem 28 SM Exercise 4.10, page 80.

Problem 29 SM Problem 4-5, page 96.

Problem 30 SM Problem 5-1, page 123.

Problem 31 SM Problem 5-6, page 123.

Problem 32 SM Problem 5-7, page 123.

Problem 33 SM Problem 5-10, page 123.

Problem 34 Show $\mathrm{SL}(n, \mathbb{R}) = \{A \in \mathbb{R}^{n \times n} \mid \det(A) = 1\}$ is a proper embedded submanifold of $\mathbb{R}^{n \times n}$.