1. Let \( f, g : \mathbb{R}^3 \to \mathbb{R} \) and \( \varphi : \mathbb{R}^3 \to \mathbb{R}^3 \) be functions defined by \( f(x, y, z) = \sqrt[3]{9y^2 + 2(x + z)} \), \( \varphi(x, y, z) = (z^2 - 2xz, y^3/3, x^2 - 2xz) \), and \( g = f \circ \varphi \). Let also \( F = \{ (x, y, z) \mid f(x, y, z) = -2 \} \) and \( S = \{ (x, y, z) \mid g(x, y, z) = -2 \} \) be surfaces in \( \mathbb{R}^3 \).

   a) Prove that \( \varphi \) maps \( S \) into \( F \), i.e. \( \varphi(S) = F \).

   b) Find all points \( P \in S \) such that the tangent plane to \( S \) at \( P \) and the tangent plane to \( F \) at \( \varphi(P) \) are parallel. Justify your answer.

2. Exercise 16 p.192 from the textbook.


5. Exercise 18 p.223 from the textbook. Justify your answer.


