

MATH 14 WINTER 2004

CALCULUS OF VECTOR-VALUED FUNCTIONS, HONORS

HOMEWORK FOR THE WEEK OF JANUARY 12 – JANUARY 16

DUE DATE: Friday, January 23 at the end of your section's lecture

- Let $f, g : \mathbb{R}^3 \rightarrow \mathbb{R}$ and $\varphi : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ 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 .
 - Prove that φ maps S into F , i.e. $\varphi(S) = F$.
 - 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.
- Exercise 16 p.192 from the textbook.
- Exercise 2 p.202 from the textbook.
- Exercise 6 p.202 from the textbook.
- Exercise 18 p.223 from the textbook. Justify your answer.
- Exercise 36 p.224 from the textbook. Justify your answer.
- Exercise 8 p.254 from the textbook. Justify your answer.
- Review exercise 3 p.255 from the textbook. Justify your answer.
- Review exercise 24 p.258 from the textbook. Justify your answer.