

SUPPLEMENTARY HOMEWORK PROBLEMS: SET 3
Math 127C, Spring 2006

1. Suppose that $A : X \rightarrow Y$ and $B : Y \rightarrow Z$ are linear maps between (finite-dimensional) linear spaces X, Y, Z . If $[A], [B], [BA]$ are the matrices of A, B, BA with respect to some bases of X, Y, Z , prove that

$$[BA] = [B][A].$$

2. Define $f : \mathbb{R}^2 \rightarrow \mathbb{R}^3$ and $g : \mathbb{R}^3 \rightarrow \mathbb{R}$ by

$$\begin{aligned} f(x, y) &= (xy, x \cos y, x \sin y), \\ g(u, v, w) &= uv + vw + wu. \end{aligned}$$

What is $g \circ f$? Compute the matrices of $f'(1, 0), g'(0, 1, 0)$ with respect to the standard bases. Use the chain rule to compute the matrix of $(g \circ f)'(1, 0)$.

3. Define $f : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ by

$$f(x, y, z) = (yz, zx, xy).$$

At what points (x, y, z) is the derivative $f'(x, y, z)$ singular?