MA2321 Exercises 1; 2014

24 September 2014

1. Let $f : M \to N$ be a constant function. Show that $f'(a)$ is zero, for each $a \in M$.

2. Let $f : M \to N$ be a linear function. Show that $f'(a)$ is equal to f for each $a \in M$. Show that $f''(a)$ is zero for each $a \in M$.

3. Let $f : \mathbf{R}^{n\times n} \to \mathbf{R}^{n\times n}$ be defined by $f(A) = A^2$. Prove that f is differentiable. Find the derivative of f.

4. Let V be the space of real non-singular $n \times n$ matrices. Let

$$f : V \to \mathbf{R}^{n\times n}$$

   be given by $f(A) = A^{-1}$. Find $f'(A)$.

5. Let $f : \mathbf{R}^{n\times n} \to \mathbf{R}^{n\times n}$ be defined by $f(A) = A^t A$. Prove that f is differentiable. Find the derivative of f. Prove that if A is an orthogonal matrix then the image of the linear operator $f'(A)$ is the space of real symmetric $n \times n$ matrices.

Note For information on courses MA2321 and MA2322
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http://www.maths.tcd.ie/ simms