

MAT257 PSET 14—Question 1

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We know that if $f : \mathbb{R}^n \rightarrow \mathbb{R}$ is a 0-form, $df = \sum_i \frac{\partial f}{\partial x^i} dx_i$. Since f, g, fg are 0-forms,

$$\begin{aligned} d(fg) &= \sum_i \frac{\partial(fg)}{\partial x^i} dx_i \\ &= \sum_i \frac{\partial f}{\partial x^i} g + f \frac{\partial g}{\partial x^i} dx_i \\ &= g \sum_i \frac{\partial f}{\partial x^i} dx_i + f \sum_i \frac{\partial g}{\partial x^i} dx_i \\ &= f dg + g df \end{aligned}$$