Q2

k-form $\lambda = \sum_i f_i \, dx_{i_1} \wedge \cdots \wedge dx_{i_k}$

l-form $\eta = \sum_j g_j \, dx_{j_1} \wedge \cdots \wedge dx_{j_l}$

$$d(\lambda \wedge \eta) = \sum_i \sum_j d(f_i g_j) \wedge dx_{i_1} \wedge \cdots \wedge dx_{i_k} \wedge dx_{j_1} \wedge \cdots \wedge dx_{j_l}$$

$$= \sum_i \sum_j (g_j \, df_i + f_i \, dg_j) \wedge dx_{i_1} \wedge \cdots \wedge dx_{i_k} \wedge dx_{j_1} \wedge \cdots \wedge dx_{j_l}$$

$$= \sum_i \sum_j \Big[(df_i \wedge dx_{i_1} \wedge \cdots \wedge dx_{i_k}) \wedge (g_j \, dx_{j_1} \wedge \cdots \wedge dx_{j_l}) + f_i \, dg_j \wedge dx_{i_1} \wedge \cdots \wedge dx_{i_k} \wedge dx_{j_1} \wedge \cdots \wedge dx_{j_l} \Big]$$

$$= \sum_i \sum_j (df_i \wedge dx_{i_1} \wedge \cdots \wedge dx_{i_k}) \wedge (g_j \, dx_{j_1} \wedge \cdots \wedge dx_{j_l}) + \sum_i \sum_j (-1)^k (f_i \, dx_{i_1} \wedge \cdots \wedge dx_{i_k}) \wedge (dg_j \wedge dx_{j_1} \wedge \cdots \wedge dx_{j_l})$$

$$= (d\lambda) \wedge \eta + (-1)^k \lambda \wedge d\eta$$