MATH 205 Homework Supplement

In the following problems, $I_k \subset \mathbb{R}^k$ is the k-cell $[0,1]^k$, and Q_k is the k-simplex. You should use the notation $(u_1, \ldots, u_k)$ to denote a point in I_k or Q_k.

In each of the following problems, ω is a k-form and Φ is a k-surface. You should write

$$\int_\Phi \omega$$

in terms of 1-dimensional integrals involving the variables u_i only. In particular, you should compute all the relevant partial derivatives and evaluate the relevant determinants. *There is no need to evaluate the one-dimensional integrals.*

1. $\omega = x_2^2\, dx_1 + x_1\, dx_2$, $\Phi(u) = (\cos u, \sin u)$, $0 \le u \le 1$.

2. $\omega = x_1 x_2\, dx_1 \wedge dx_2 + \sin x_3\, dx_1 \wedge dx_3$, $\Phi : Q_2 \to \mathbb{R}^3$, $\Phi(u_1, u_2) = (u_1 + u_2, e^{u_2}, 0)$.

3. $\omega = dx_1 \wedge dx_2 \wedge dx_3$, $\Phi : Q_3 \to \mathbb{R}^3$, $\Phi(u_1, u_2, u_3) = (u_1 u_2, u_2, u_3^2)$.