

"QUIZ" for Lecture 16

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Section: 23

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q16FirstLast.pdf) ASAP BUT NO LATER THAN Nov. 2, 8:00pm

1. Compute the Jacobian of the transformation

$$\Phi(r, s) = (rs, r + s)$$

$$x = rs, \quad y = r + s$$

$$J = (x_r)(y_s) - (x_s)(y_r) = s(1) - r(1) = s - r$$

$$\boxed{s - r}$$

2. Let $D = \Phi(R)$ where $\Phi(u, v) = (u + v, v^2)$ and $R = [0, 6] \times [1, 2]$. Calculate

$$\iint_D y \, dA$$

(Note: it is not necessary to compute D).

$$x = u + v, \quad y = v^2$$

$$J = (x_u)(y_v) - (x_v)(y_u) = (1)(2v) - (1)(0) = 2v$$

$$\iint_D y \, dA = \iint_R y J \, dA = \iint_R (v^2)(2v) \, dA = \iint_R 2v^3 \, dA$$

$$\{(u, v) \mid 0 \leq u \leq 6, 1 \leq v \leq 2\}$$

$$\int_0^6 \int_1^2 2v^3 \, dv \, du = \left(\int_0^6 du \right) \left(\int_1^2 2v^3 \, dv \right) = (u \Big|_0^6) \left(\frac{v^4}{2} \Big|_1^2 \right) = (6-0) \cdot \left(\frac{2^4 - 1^4}{2} \right) = 6 \cdot \left(\frac{15}{2} \right) = \boxed{45}$$