**"QUIZ" for Lecture 16**

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**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 transfomation

$$\Phi(r,s) = (\overset{x}{rs}, \overset{y}{r+s})$$

$x_r = s$ $\quad x_s = r$

$y_r = 1$ $\quad y_s = 1$

$$\begin{vmatrix} s & r \\ 1 & 1 \end{vmatrix} = s(1) - r(1) = s - r$$

**2.** Let $\mathcal{D} = \Phi(\mathcal{R})$ where $\Phi(u,v) = (\overset{x}{u+v}, \overset{y}{v^2})$ and $R = \overset{x}{[0,6]} \times \overset{y}{[1,2]}$. Calculate

$$\int\int_{\mathcal{D}} y\, dA \quad .$$

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

$x_u = 1$ $\quad x_v = 1$

$y_u = 0$ $\quad y_v = 2v$

$$\begin{vmatrix} 1 & 1 \\ 0 & 2v \end{vmatrix} = 1(2v) - 1(0) = 2v$$

$\phi(0,6) \rightarrow$ $u+v = 0$, $v^2 = 6$, $v = \sqrt{6}$, $u = -\sqrt{6}$ $(-\sqrt{6}, \sqrt{6})$

$\phi(1,2) \rightarrow$ $u+v = 1$, $v^2 = 0$, $v = 0$, $u = 1$ $(1,0)$

$$\int_{-\sqrt{6}}^{\sqrt{6}} \int_{0}^{1} v^2\, |2v|\, du\, dv$$

$$\int_{-\sqrt{6}}^{\sqrt{6}} \int_{0}^{1} 2v^3\, du\, dv \rightarrow \int_{-\sqrt{6}}^{\sqrt{6}} 2v^3\, dv \rightarrow \frac{v^4}{2}\Big|_{-\sqrt{6}}^{\sqrt{6}} = \frac{36}{4} - \frac{36}{4} = 0$$