**"QUIZ" for Lecture 15**

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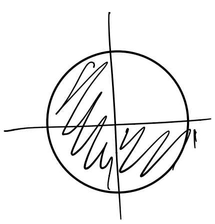
**E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: qXFirstLast.pdf) ASAP BUT NO LATER THAN Oct. 29, 8:00pm**

**1.** Use polar coordinates to compute the double integral

$$\int\int_D xy\,dA \quad ,$$

where

$$D = \{(x,y)\,|\,x^2+y^2 \leq 1\,,\,x \geq 0\,,\,y \geq 0\} \quad .$$



$0 \leq r \leq 1$
$0 \leq \theta \leq 1$

$\int_0^1\int_0^1 r\cos\theta \cdot r\sin\theta \, r\,dr\,d\theta = \int_0^1\int_0^1 r^3\cos\theta\sin\theta\,dr\,d\theta$

$\int_0^1 \cos\theta\sin\theta\, r^3\,dr = \frac{\cos\theta\sin\theta\, r^4}{4}\Big|_0^1 = \frac{\cos\theta\sin\theta}{4}$

$\frac{1}{4}\int_0^1 \cos\theta\sin\theta\,d\theta \rightarrow \int u\,du = \frac{u^2}{2} \rightarrow \frac{\sin^2\theta}{2}\Big|_0^1$

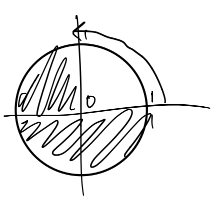
$u = \sin\theta \quad du = \cos\theta\,d\theta$

$= \frac{1}{4}\left(\frac{\sin^2(1)}{2} - \frac{\sin^2(0)}{2}\right) = \boxed{\frac{\sin^2(1)}{8}}$

**2.** Evaluate the iterated integral by converting it to polar coordinates

$$\int_0^1\int_0^{\sqrt{1-y^2}} e^{x^2+y^2}\,dx\,dy \quad . = \iint e^r \cdot r\,dr\,d\theta$$

**Note:** The previous version had a typo ($dy\,dx$ instead of $dx\,dy$, that made it nonsense). I thank Yidi "Wendy" Weng for pointing it out (and see won a dolllar).



$x = \sqrt{1-y^2} \quad x = 0$
$x^2 = 1 - y^2$
$x^2 + y^2 = 1$

$1 \leq r \leq 3$
$0 \leq \theta \leq \pi/2$

$\int_0^{\pi/2}\int_1^3 e^r r\,dr\,d\theta$

$\int_1^3 e^r r\,dr = e^r\frac{r^2}{2}\Big|_1^3 = \frac{9e^3}{2} - \frac{e}{2}$

$\int_0^{\pi/2} \frac{9e^3 - e}{2}\,d\theta = \frac{9e^3-e}{2}\left(\theta\Big|_0^{\pi/2}\right) = \boxed{\frac{9e^3-e}{2}(\pi/2)}$