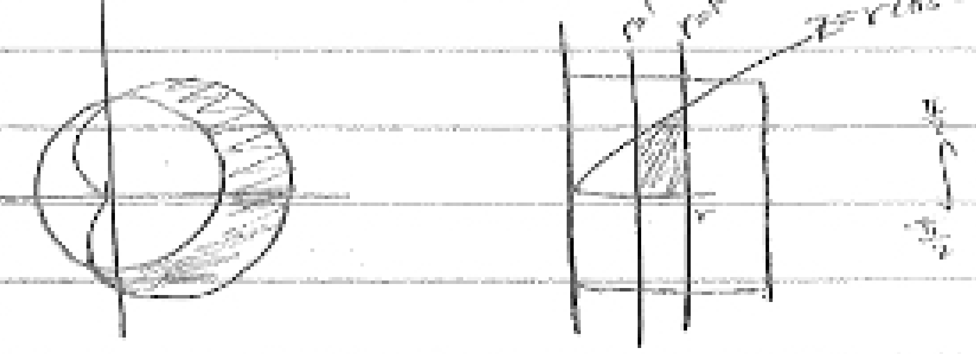
11/3/14

Homework Problem 15.4 # 39.



$$\int_{-\pi/2}^{\pi/2}\int_{1}^{1+\cos\theta}\int_{0}^{r\cos\theta} r\,dz\,dr\,d\theta$$

$$\iint rz\Big|_0^{r\cos\theta} dr\,d\theta$$

$$\iint r^2\cos\theta\,dr\,d\theta$$

$$\int \frac{r^3}{3}\cos\theta\Big|_1^{1+\cos\theta} d\theta$$

$$\int \tfrac{1}{3}(1+3\cos\theta+3\cos^2\theta+\cos^3\theta)\cos\theta-\tfrac{1}{3}\cos\theta\;d\theta$$

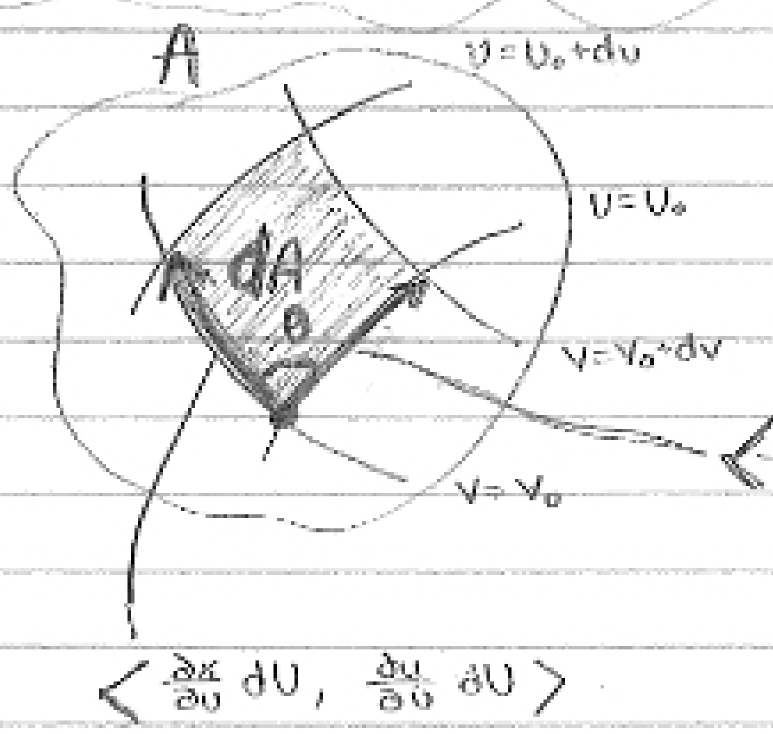
$$\tfrac{1}{3}\int 3\cos^2\theta+3\cos^3\theta+\cos^4\theta\;d\theta$$

Not going to finish! Not fun

$u = u(x,y)$

$v = v(x,y)$

$$\iint_A f(xy)\,dx\,dy = \iint_B g(u,v)\,du\,dv$$



dA = formula in u & v

$$\iint_A f\,dA = \iint_B h\,dB$$

$\langle \frac{\partial x}{\partial v}dV, \frac{\partial y}{\partial v}dV\rangle$

$\langle \frac{\partial x}{\partial u}dU, \frac{\partial y}{\partial u}dU\rangle$

$$\left\langle \frac{\partial x}{\partial u}\,du, \frac{\partial y}{\partial u}\,du \right\rangle \times \left\langle \frac{\partial x}{\partial v}\,dv, \frac{\partial y}{\partial v}\,dv \right\rangle$$

$$= \begin{bmatrix} i & j & k \\ \frac{\partial x}{\partial u} & \frac{\partial y}{\partial u} & 0 \\ \frac{\partial x}{\partial v} & \frac{\partial y}{\partial v} & 0 \end{bmatrix} du\,dv$$

$$= \left\langle 0, 0, \frac{\partial x}{\partial u}\frac{\partial y}{\partial v} - \frac{\partial x}{\partial v}\frac{\partial y}{\partial u} \right\rangle du\,dv$$

$$\text{length} = \underbrace{\left| \frac{\partial x}{\partial u}\frac{\partial y}{\partial v} - \frac{\partial x}{\partial v}\frac{\partial y}{\partial u} \right|}_{\text{Jacobian}} du\,dv = dA$$

$$\iint_A dx\,dy = \iint_B \left| \frac{\partial(x,y)}{\partial(u,v)} \right| du\,dv$$

Evaluate

$$\iint_A 3x^2 + 14xy + 8y^2 \, dx\,dy$$

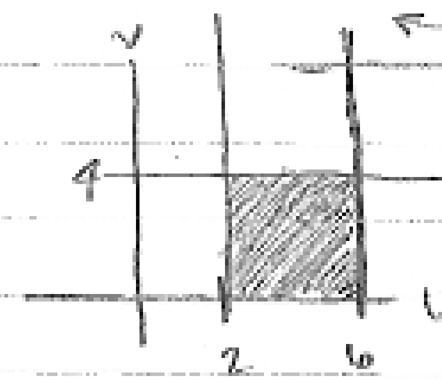
where A is bounded by:

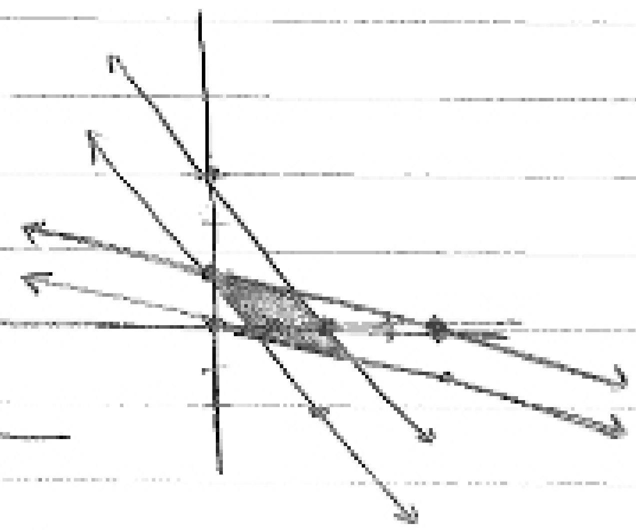
$3x + 2y = 2$ $\quad$ $x + 4y = 0$

$3x + 2y = 6$ $\quad$ $x + 4y = 4$

Let $u = 3x + 2y$

$v = x + 4y$





Will finish on Tuesday