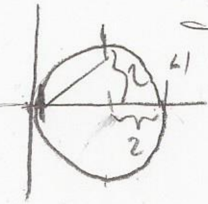
Name: Erik Sundblad **Worksheet 23**

Exercise 1. Find the area of the region inside the circle $r = 4\cos\theta$.

$\int\int 4\cos\theta$ $\quad 4(\cos\frac{\pi}{4}) = \sqrt{8}$ $\quad \iint_R f(r,\theta)\, r\,dr\,d\theta$



$2\int_0^{\pi}$ $\quad 2\int_0^{2\pi}$

$\theta = 0$

$r = 4$

$\theta = 3\pi/2$

$r = -4$

$2\int\int_0^{\pi}$

$\int_0^{\pi}\int_0^{4\cos\theta} r\,dr\,d\theta \qquad \frac{r^2}{2}\Big|_0^{4\cos\theta}$

$\int_0^{2\pi} \frac{1}{2}(4\cos\theta)^2 \qquad 8\int_0^{2\pi}\cos^2\theta = 8\int_0^{2\pi}\frac{1}{2} + \frac{\cos 2\theta}{2}$

$2\theta = u$

$\cos 2\theta \qquad 2\,d\theta = du$

$8\left(\frac{\theta}{2} + \frac{\cos 2\theta}{4}\right)\Big|_0^{\pi} \quad 8\left[\left(\frac{\pi}{2} + \frac{1}{4}\right) - \left(0 + \frac{1}{4}\right)\right] = 4\pi$

Exercise 2. Evaluate the integral $\int\int_R \sqrt{\frac{x-y}{x+y+1}}dA$, where R is the square with vertices $(0,0)$, $(1,-1)$, $(2,0)$, and $(1,1)$. Use the transformation $u = x - y$ and $v = x + y$.

$$\iint \sqrt{\frac{u}{v+1}}$$

$u = x - y$
$v = x + y$

Test 15.4-15.7 16.1-16.3 Review

Level Curves/Surfaces

- Graph
- Gradiend ∇

Directional Der

Tangent Planes at point on Surface

Chain Rule

Implicit Diff f_x, f_y

Max/Min prob

2nd Derivative

Double Integration

- Integrating
- Average Value $\rightarrow$ $f \frac{1}{\text{area}}$ region $\iint_R f(x,y)\,dx$
- Re-ordering
- Conversion to Polar
- Area/Volume Calculations