

Math 2605-C Quiz 7  
4 March 10

Name: SOLUTIONS

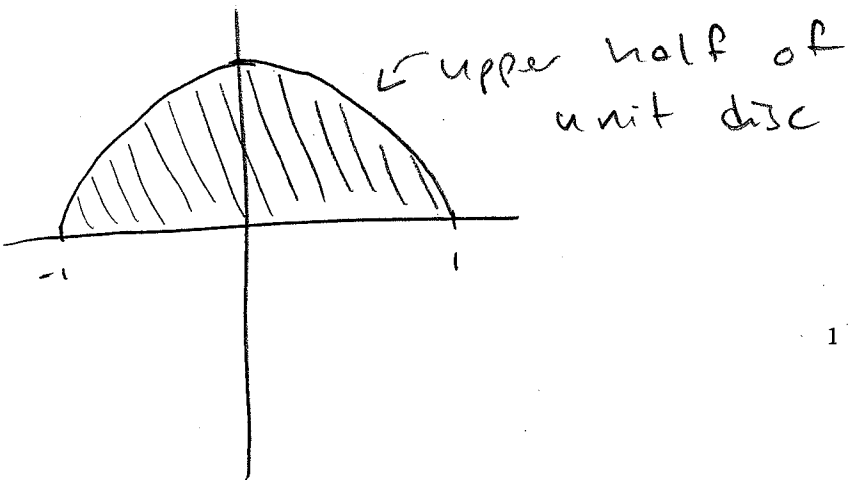
Consider the following double integral:

$$\int_{-1}^1 \int_0^{\sqrt{1-x^2}} \frac{e^{\sqrt{x^2+y^2}}}{\sqrt{x^2+y^2}} dy dx$$

- (3 points) Sketch the region that is being integrated over, and describe it in words.
- (7 points) Evaluate the integral, changing the coordinate system if necessary.

①  $-1 \leq x \leq 1$  ;  $0 \leq y \leq \sqrt{1-x^2}$

$y = \sqrt{1-x^2}$  is the upper half of the unit circle, so our region is



② Convert to polar.

Geometrically, we have:  $0 \leq r \leq 1$ ,  
 $0 \leq \theta \leq \pi$

$$x = r \cos \theta, y = r \sin \theta \Rightarrow x^2 + y^2 = r^2$$

So our function becomes:  $\frac{e^r}{r}$

$dy dx$  becomes  $r dr d\theta$

$$\int_0^{\pi} \int_0^1 e^r dr d\theta$$

$$= (\theta|_0^{\pi}) (e^r|_0^1)$$

$$= \pi(e^1 - e^0) = \boxed{\pi(e-1)}$$