Math 213 Class 11: Polar Coordinates #1

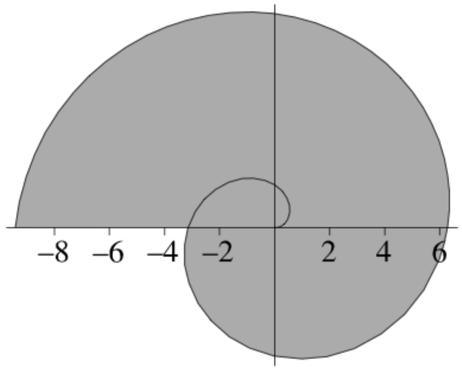
1. Integrate $f(x, y) = x^2 + y^2$ over $D = \{(x, y) : 1 \leq x^2 + y^2 \leq 4\}$ using polar coordinates.

2. Sketch the region of integration and evaluate by changing to polar coordinates.

$$\int_0^3 \int_0^{\sqrt{9-y^2}} \sqrt{x^2 + y^2}\, dx\, dy$$

Math 213 Class 11: Polar Coordinates #2

1. Find the area of the region inside the curve $r = \theta$, $0 \le \theta \le 3\pi$.



2. Rewrite $\int_{-2}^{2} \int_{0}^{\sqrt{4-x^2}} e^{-x^2-y^2}\, dy\, dx$ as a polar integral and evaluate it.

Math 213 Class 11: Surfaces

1. Set up and compute the surface integral for the part of the surface $z = x^2 - y^2$ inside the cylinder $x^2 + y^2 = 9$.

2. Compute the surface area of the part of the surface $z = y^2$ above the triangle with vertices $(0, 1, 0)$, $(1, 0, 0)$, and $(1, 1, 0)$.

3. Compute the surface area of the part of the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ $(a > 0, b > 0, c > 0)$ in the first octant $(x \geq 0, y \geq 0, z \geq 0)$.

Math 213 Calculus III

Reading the Text

Read Section 12.7-12.9 and answer the following questions

1. In the expression $\int\int\int_E f(x,y,z)\,dV$, what does the *E* and the *dV* mean?
2. What is the solid described by the integral $\int_{\pi/2}^{\pi}\int_0^{2\pi}\int_0^{\sqrt{3}} \rho^2 \sin\phi \; d\rho\, d\theta\, d\phi$?
3. When we convert a double integral from rectangular coordinates to spherical coordinates, where does the $\rho^2 \sin\phi$ term come from?
4. The *unit square* is the square with side length 1 and lower left corner at the origin. What is the area of the image *R* (in the *xy* plane) of the unit square *S* (in the *uv* plane) under the transformation $\begin{array}{l} x = u + 2v \\ y = -6u - v \end{array}$?