

## MA205

Board Sheet - 04 October 2007, Polar Coordinates

### Polar Coordinates

1.  $r^2 = x^2 + y^2$
2.  $x = r \cos \theta$
3.  $y = r \sin \theta$
4. 
$$\iint_R f(x, y) dA = \int_{\alpha}^{\beta} \int_a^b f(r \cos \theta, r \sin \theta) r dr d\theta$$

### Polar Coordinates Algorithm

1. If possible create a 3D plot of the surface over the region
  - Study diagram to determine if this is positive, negative, or mixed.
  - Establish a very rough idea of the volume of the space
2. Draw and Label the Region
3. Determine the limits of integration
  - Max and Min radial limits
  - Max and Min angular limits
4. Convert the integrand to an equivalent polar expression
5. Set up the iterated integral
6. Compute/Evaluate the inside integral
7. Compute/Evaluate the outside integral
8. Look back, does it make sense?