

# 1443-501 Spring 2002

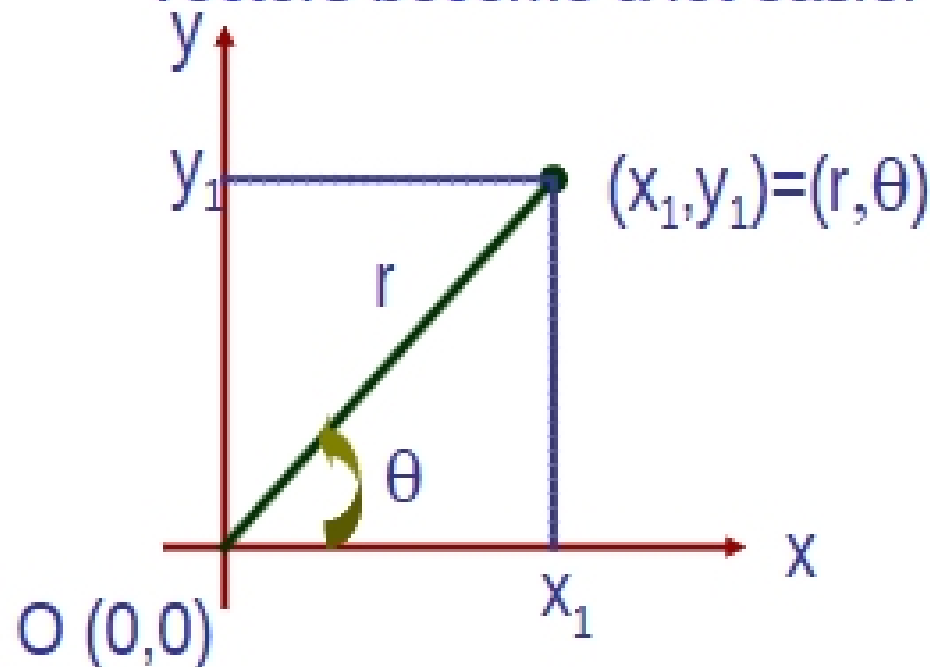
## Lecture #3

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1. Coordinate Systems
2. Vector Properties and Operations
3. 2-dim Displacement, Velocity, & Acceleration
4. 2-dim Motion Under Constant Acceleration
5. Projectile Motion

# Coordinate Systems

- Make it easy to express locations or positions
- Two commonly used systems, depending on convenience
  - Cartesian (Rectangular) Coordinate System
    - Coordinates are expressed in  $(x,y)$
  - Polar Coordinate System
    - Coordinates are expressed in  $(r,\theta)$
- Vectors become a lot easier to express and compute



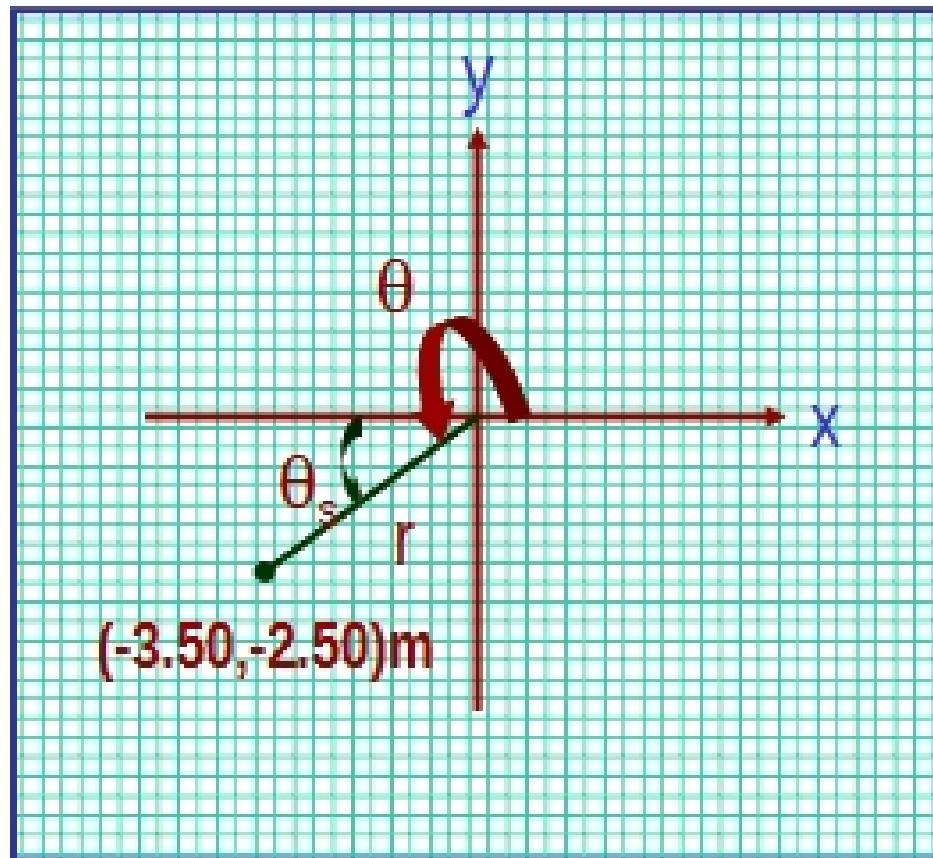
How are Cartesian and Polar coordinates related??

$$x = r \cos \theta$$
$$y = r \sin \theta$$

$$r = \sqrt{(x_1^2 + y_1^2)}$$
$$\tan \theta = \frac{y_1}{x_1}$$

# Example 3.1

Cartesian Coordinate of a point in the xy plane are  $(x,y) = (-3.50, -2.50)\text{m}$ . Find the polar coordinates of this point.



$$\begin{aligned} r &= \sqrt{(x_1^2 + y_1^2)} = \\ &= \sqrt{((-3.50)^2 + (-2.50)^2)} \\ &= \sqrt{18.5} = 4.30(\text{m}) \end{aligned}$$

$$\theta = 180 + \theta_s$$

$$\tan \theta_s = \frac{-2.50}{-3.50} = \frac{5}{7}$$

$$\theta_s = \tan^{-1} \left[ \frac{5}{7} \right] = 35.5^\circ$$

$$\therefore \theta = 180 + \theta_s = 180^\circ + 35.5^\circ = 216^\circ$$