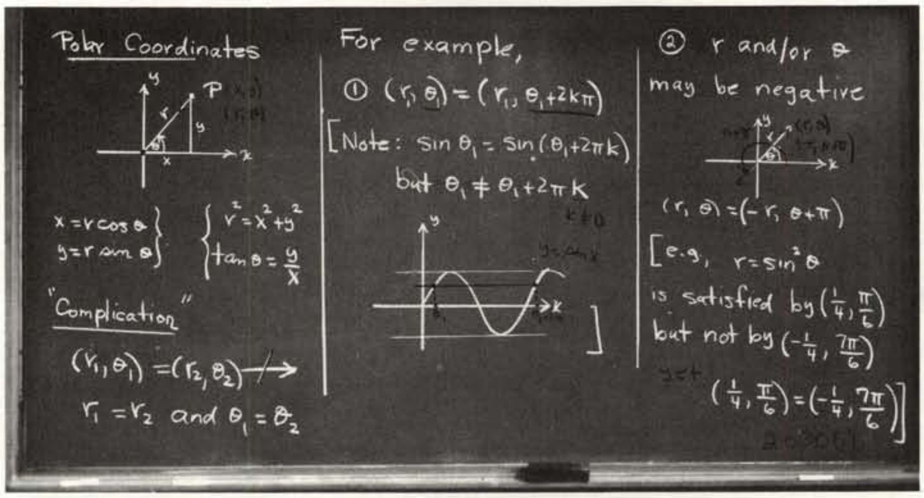
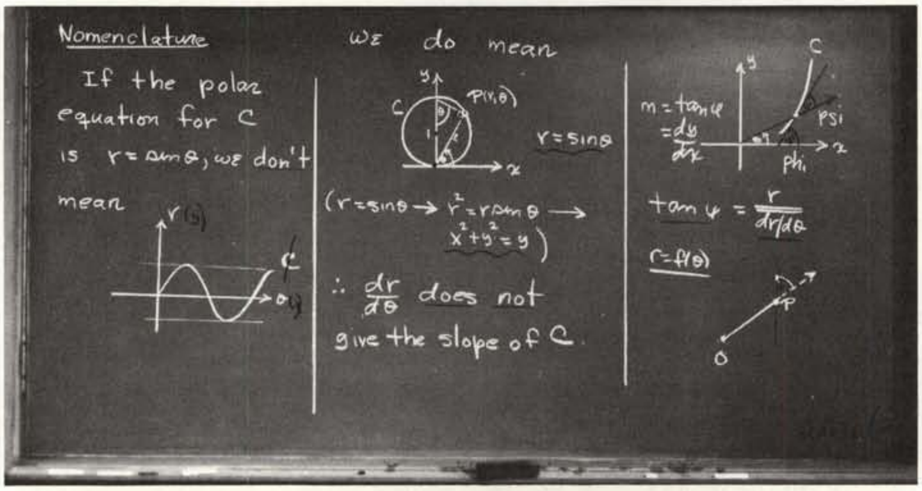
Unit 4: Polar Coordinates I

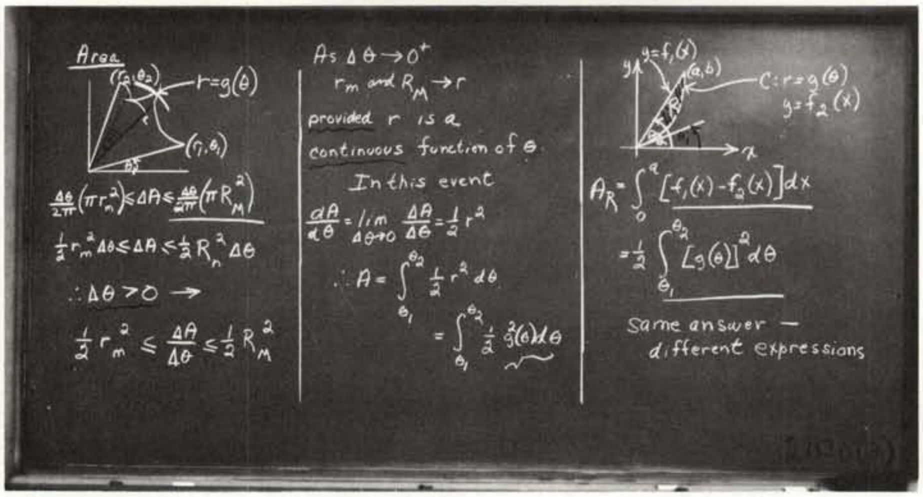
1. Lecture 2.030



a.



b.



c.

2. Read Thomas, Sections 11.1, 11.2, and 11.3.

3. Exercises:

2.4.1(L)

Describe the curve C if its polar equation is $r = \cos\theta$, $0 \leqslant \theta \leqslant \pi$.

2.4.2

The curve C is given by the polar equation

$$\frac{1}{r^2} = 4\cos^2\theta + 9\sin^2\theta.$$

Sketch C by converting its polar equation into the equivalent Cartesian form.

2.4.3(L)

a. Plot the curve C if its polar equation is $r = \sec\theta$, $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$.

b. Plot the curve whose polar equation is $r = \theta$, and then write the equation of this curve in Cartesian coordinates.

2.4.4(L)

a. (1) The curve C is given by the polar equation $r = f(\theta)$. What can we conclude about the symmetry of C if we know that whenever (r_o,θ_o) belongs to C so also does $(-r_o,-\theta_o)$?

(2) With C as above, what can we conclude about its symmetry if we know instead that whenever (r_o,θ_o) is on C so is $(-r_o,\pi-\theta_o)$?

b. Use the result of (a) together with the information contained in $\frac{dr}{d\theta}$ to sketch the curve whose polar equation is $r = \sin 2\theta$.

c. What is the Cartesian equation of the curve in (b)?

2.4.5(L)

a. Let C_1 and C_2 be defined by the polar equations $r = \cos\theta + 1$ and $r = \cos\theta - 1$, respectively. Show that C_1 and C_2 have no simultaneous points of intersection.

b. With C_1 and C_2 as in part (a), sketch these two curves.

c. Explain why the results of (a) and (b) are not contradictory.

2.4.6(L)

The curve C_1 is defined by the polar equation $r = \cos 2\theta$, while C_2 is defined by $r = 1 + \cos\theta$. Find all points at which C_1 and C_2 intersect.

2.4.7(L)

Let C denote the curve whose polar equation is $r = \sin\frac{\theta}{4}$, $0° \leqslant \theta \leqslant 720°$. If P denotes the point $(\frac{1}{2}, 240°)$, does P belong to C? Explain.

2.4.8

Find all points of intersection of the curves C_1 and C_2 if the polar equation for C_1 is $r = 1 + \cos\theta$ and the polar equation for C_2 is $r = 1 + \sin\theta$.