

HOMEWORK 21
CALCULUS III
DUE 04-10

- (1) (a) Find the exact formula for the area of the polar rectangle where r goes from $r = r_1$ to $r = r_1 + \Delta r$, and θ goes from $\theta = \theta_1$ to $\theta = \theta_1 + \Delta\theta$. Your answer may involve some or all of the variables r_1 , θ_1 , Δr , and $\Delta\theta$. (There is a picture in #14.3.75.)
(b) Show that, to first order, your formula becomes the formula $r \, dr \, d\theta$ from class.
 - (2) In rectangular co-ordinates, fixing an x -value gives $x = x_1$, the equation of a vertical line; and fixing a y -value gives $y = y_1$, the equation of a horizontal line.
(a) What shape do we get by fixing an r -value in polar co-ordinates? Explain.
(b) What shape do we get by fixing a θ -value in polar co-ordinates? Explain.
 - (3) In class, we found that the equation for the cardioid in #14.3.2 is $r = 2(1 - \cos(\theta))$. Write down the equation in rectangular co-ordinates (in terms of x and y only). Simplify as much as possible.
- **Eight** book problems: #14.3.2, 9, 10, 13, 15, 45, 46, 47.