

You have 45 minutes to complete this quiz. Eyes on your own paper and good luck!

1. **Definitions/Concepts.**

- (a) (3 pts) **Parametrizing a Line:** Given $\frac{dx}{dt} = a$ and $\frac{dy}{dt} = b$, a line passing through the point (x_0, y_0) has the following parametric equations:

$$x(t) =$$

$$y(t) =$$

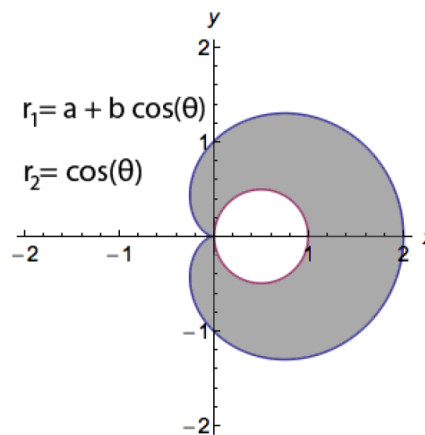
The non-parametric equation for the same line is given by:

- (b) (1 pt) Given polar coordinates (r, θ) , the same point in Cartesian coordinates is

$$x =$$

$$y =$$

2. **Questions/Problems.** (from Fall 2011 Exam 2) Members of the recruitment committee for the Mars University (MU) chapter of the fraternity Epsilon Rho Rho (ERR) are designing a pledge pin to distribute during Rush Week. The pin takes the shape of a cardioid with a circular hole in it. The cardioid is given by a polar equation of the form $r_1 = a + b \cos \theta$, while the circular hole has the polar equation $r_2 = \cos \theta$. The pin is pictured below, where the x - and y -axes are measured in inches.



- (a) (5 pts) The committee plans on coating one side of the pin in gold plating, which costs 3 dollars per square inch. Give an expression representing the cost to plate one face of the pin in gold. Your answer may involve integrals and the constants a and b .

(b) (3 pts) Find a and b .

3. **Computations/Algebra.** (2 pts) Determine if the following integrals converge or diverge. If an integral converges, compute the value to which it converges. If an integral diverges, you must explain why.

(a) $\int_{-2}^2 \frac{dx}{x^2} =$

(b) $\int_{-1}^2 \frac{dx}{\sqrt{2-x}} =$

(c) $\int_{10}^{\infty} \frac{5+2\sin 4\theta}{\theta} d\theta =$

(d) $\int_1^\infty \frac{x}{1+x} dx =$