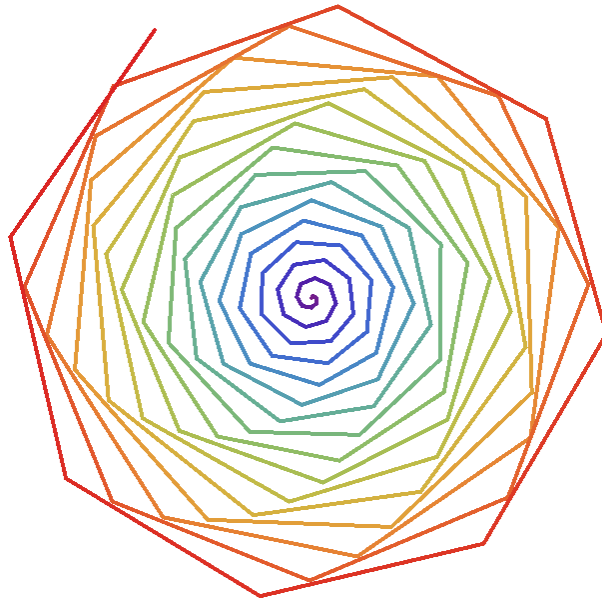


# WORKSHEET V

## PARAMETRIC EQUATIONS – A BRIEF INTRODUCTION

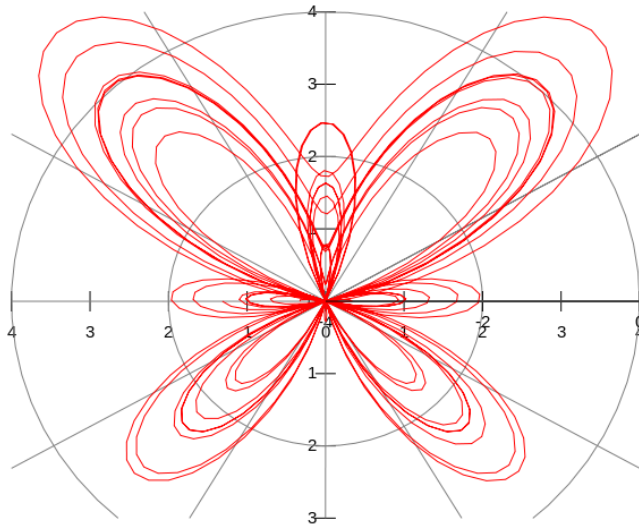


1. Sketch the curve  $x(t) = 3t$ ,  $y(t) = t^2 + 1$ . Express  $y$  as a function of  $x$ .
2. Describe the parameterized curve  $x(t) = 3 \cos t$ ,  $y(t) = 4 \cos t$ ,  $0 \leq t \leq 2\pi$ .

What is the relationship between the given curve and each of the following?

- (a)  $x(t) = -3 \cos t$ ,  $y(t) = 4 \cos t$ ,  $0 \leq t \leq 2\pi$ .
- (b)  $x(t) = 3 \cos 2t$ ,  $y(t) = 4 \cos 2t$ ,  $0 \leq t \leq 2\pi$ .
- (c)  $x(t) = 1 - 3 \cos 2t$ ,  $y(t) = 1 - 4 \cos 2t$ ,  $0 \leq t \leq 2\pi$ .

3. Show that the following is a parameterization of the cycloid:  $x(\theta) = a(\theta - \sin \theta)$ ,  $y(\theta) = a(1 - \cos \theta)$ ,  $-\infty < \theta < \infty$ .
4. Show that  $x = a \cos t + h$ ,  $y = b \sin t + k$ ,  $0 \leq t \leq 2\pi$ , is a parametric equation of an ellipse with center at  $(h, k)$  and axes of length  $2a$  and  $2b$ .
5. Find a parameterization of the straight line  $y = 3x + 4$ .
6. Find a parameterization of the straight line segment joining the points  $P = (3, 5)$  to  $Q = (7, 11)$ .
7. Find a parameterization of the curve  $y = x^2$  from  $P = (-1, 1)$  to  $Q = (4, 16)$ .
8. Generalize problem 7 for any curve of the form  $y = f(x)$  from  $x = a$  to  $x = b$ .



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