PARAMETRIC EQUATIONS

1. Consider the parametric equations $x(t) = \cos t$, $y(t) = \cos^2 t$.

    a) Sketch the graph of the curve described by the equations.
    b) How is is the curve traversed as t increases from 0 to π?
    c) How is is the curve traversed as t increases from $-\pi/2$ to $3\pi/2$?
    d) Find a new set of parametric equations that describes a different way of traversing the same curve.

t	$x = \cos t$	$y = \cos^2 t$
$-\pi/2$		
$-\pi/4$		
0		
$\pi/4$		
$\pi/2$		
$3\pi/4$		
π		
$5\pi/4$		
$3\pi/2$		

2. A parametric description of the line from the point (x_0, y_0) to the point (x_1, y_1) is $x(t) = x_0 + t(x_1 - x_0)$, $y(t) = y_0 + t(y_1 - y_0)$.

    a) Find a parametric description of the line from $(2, -1)$ to $(-1, 4)$.

    b) How is the line traversed as t increases from 0 to 1?

    c) What happens when t is less than 0 or greater than 1?

    d) Find a different parametric description of the same line.

3. Consider the parametric equations $x(t) = \sqrt{t} - 1$, $y(t) = 2t - 1$.

    a) Solve $x = \sqrt{t} - 1$ for t.

    b) Substitute your solution into $y = 2t - 1$ to get an expression of the form $y = f(x)$. (This is one way to **eliminate the parameter**).

Challenge. Find a parametric description of the curve traced out by a point on the outside of a wheel of radius 1 as the wheel rolls. Hint: start with the point on the bottom of the wheel and then use the angle of rotation as the parameter.