

More Parametrics

Problem 1. Let

$$x(t) = t^2 - 1 \quad y(t) = t^3 \quad t \geq 0$$

- (a) Plot the curve (without using a graphing calculator!)
- (b) Find the cartesian equation for the curve.

Problem 2. Find a set of parametric equations for the curve $x^2 + y^2 = 1$ without using trig functions!

Problem 3. Let

$$y^3 = e^x - 1$$

- (a) Find 2 different sets of parametric equations for the curve.
- (b) Plot the curve. [*What properties can you compute that will help you plot the curve?*]

Areas

Problem 4. Find the formula for area under a parametric curve and write it down on your board!

Problem 5. Find the area for the following problems.

- (a) The region enclosed by the parametric curve $x(t) = -t^2 + 2t$, $y(t) = t/2$ and the y -axis.
- (b) The region inside the ellipse $x = a \cos \theta$ and $y = b \sin \theta$.
- (c) The region enclosed by the curve

$$x(t) = t^2 - 1 \quad y(t) = t(t - 1)(t + 1).$$

Arc Lengths

Problem 6. Find the formula for length of a parametric curve and write it down on your board!

Problem 7. Find the length of the following curves.

- (a) The upper half of the unit circle.
- (b) $x(t) = t^2 - 1$ and $y(t) = t(t - 1)(t + 1)$ for $0 \leq t \leq 4$.

Problem 8. Set up the integral for the length of the following curves.

- (a) The ellipse $x = a \cos \theta$ and $y = b \sin \theta$.
- (b) The curve $x = 1 + \ln t$ and $y = e^{t^2}$.