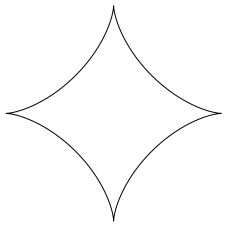
18.022 Recitation Handout
8 October 2014

1. Sketch the image of the path $\mathbf{x}(t) = (\cos t, e^t)$.

2. (3.1.25 in *Colley*) A malfunctioning rocket is traveling according to a path $\mathbf{x}(t) = (e^{2t}, 3t^3 - 2t, t - 1/t)$ in the hope of reaching a repair station at the point $(7e^4, 35, 5)$. (Here t represents time in minutes and spatial coordinates are measured in miles). At $t = 2$, the rocket's engines suddenly cease. Will the rocket coast into the repair station?

3. (3.2.7 in *Colley*) Calculate total length of the curve given by $(a\cos^3 t, a\sin^3 t)$, where a is a positive constant. This is the shape you get when you roll a circle of radius $a/4$ around inside a circle of radius a and track the trajectory of a point on the smaller circle (see below).



4. Explain why the arclength of $\sin(1/x)$ over $x \in [0,1]$ does not exist (no calculation necessary).

(b) Does the arclength of $x\sin(1/x)$ over $x \in [0,1]$ exist?

(c) Does the arclength of $x^2\sin(1/x)$ over $x \in [0,1]$ exist?

(d) (Fun/Challenge) Determine the values of m and n for which $x^m\sin(x^n)$ has finite arc length over $x \in [0,1]$.