0.4pt0pt **Name:** ______________________ # Work Sheet #7

In this worksheet we will study vector functions and their derivatives.

1. You are given two surfaces in $\mathbf{R}^3$ that intersect in two distinct curves. Your job is to describe these curves.

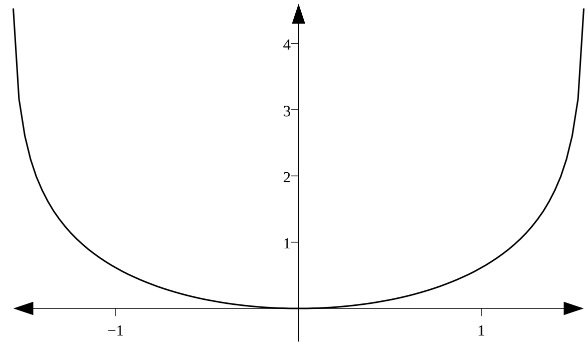
   (a) Describe, intuitively, the two curves in the intersection of the ellipsoid $\frac{9}{4}x^2 + \frac{9}{4}y^2 + z^2 = 9$ and the cylinder $x^2 + y^2 = 1$.

   (b) Give parametric equations for the two curves.

   (c) Now consider the curve $\mathbf{r}(t) = \langle \sin t, \cos t, \sin t \rangle$. Show that it lies on the intersection of the two cylinders $x^2 + y^2 = 1$ and $y^2 + z^2 = 1$. Is it the complete intersection?

(there's more on the back...)

2. Consider the curve in $\mathbf{R}^2$ given by $\mathbf{r}(t) = \langle t, -\ln(\cos t)\rangle$ on the interval $-\dfrac{\pi}{2} < t < \dfrac{\pi}{2}$.



(a) Compute $\mathbf{r}'(t)$. Sketch the tangent vectors at $t = -\frac{\pi}{3}$, $t = -\frac{\pi}{6}$, $t = 0$, $t = \frac{\pi}{6}$ and $t = \frac{\pi}{3}$.

(b) For each value of t above, what is the length of the tangent vector. What can you say about the speed of a particle moving along this curve?

(c) For each value of t above, what angle does the tangent vector make with the x-axis?