Homework Section 13.1

1. Find the domain of $\mathbf{r}(t)=\left\langle t^2, \frac{5}{t}, \sqrt{2t-1}\right\rangle$.

2. Evaluate the limits:

   a) $\lim\limits_{t\to 0}\left(\mathbf{r}(t)=\left\langle \sin t, \frac{1-e^t}{t}, \frac{2-\sqrt{t+4}}{6t}\right\rangle\right)$

   b) $\lim\limits_{t\to \infty}\left(\mathbf{r}(t)=e^{-t}\mathbf{i}+\arctan t\mathbf{j}+\frac{2t^2+t+1}{t^2-3}\mathbf{k}\right)$

3. Sketch the graph of $\mathbf{r}(t)$. Use arrows to indicate the direction that t increases.

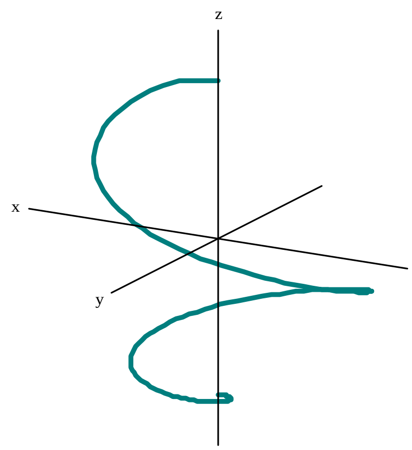
   a) $\mathbf{r}(t)=\left\langle t^2, t\right\rangle$

   b) $\mathbf{r}(t)=2\cos t\mathbf{i}+3\sin t\mathbf{j}$

   c) $\mathbf{r}(t)=2t\mathbf{i}+(1-t)\mathbf{j}-3t\mathbf{k}$

   d) $\mathbf{r}(t)=\left\langle t, 2\sin t, \cos t\right\rangle$

4. Show that the curve $\mathbf{r}(t)=\left\langle \cos t\sin\sqrt{t}, \sin t\sin\sqrt{t}, \cos\sqrt{t}\right\rangle$ lies entirely on the unit sphere (see $\mathbf{r}(t)$ picture below).



5. Find a vector-valued function with first coordinate $x=t^3$ and second coordinate $y=t$ that lies entirely on the unit sphere.

6. Come up with your own vector-valued function, different from those in the two previous problems, that lies entirely on the unit sphere.