Math 143 Set 15

1. Sketch the curve described by the vector valued function:

a. $\mathbf{r}(t) = \langle \sin t, t \rangle$

b. $\mathbf{r}(t) = \langle 1, \cos t, 2\sin t \rangle$

2. Show that the curve described by $\mathbf{r}(t) = \langle t\cos t, t\sin t, t \rangle$ lies on the cone $z^2 = x^2 + y^2$ and use this fact to sketch the curve.

3. At which points do $\mathbf{r}(t) = \langle \sin t, \cos t, t \rangle$ and $x^2 + y^2 + z^2 = 5$ intersect?

4. Find a unit tangent vector to the vector valued function at the indicated point

a. $\mathbf{r}(t) = \langle te^{-t}, 2\arctan t, 2e^t \rangle$ at $t = 0$.

b. $\mathbf{r}(t) = \langle \cos t, 3t, 2\sin 2t \rangle$ at $t = 0$.

c. $\mathbf{r}(t) = \langle 2\sin t, \tan t, 2\cos t \rangle$ at $t = \pi/4$.

5. If $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$, find $\mathbf{r}'(t)$, $\mathbf{r}''(t)$, $\mathbf{r}'(t) \times \mathbf{r}''(t)$, and $\mathbf{r}'(t) \cdot \mathbf{r}''(t)$.

6. Find the parametric equations for the line tangent to the curve at the given point:

a. $\mathbf{r}(t) = \langle e^{-t}\cos t, e^{-t}\sin t, e^{-t} \rangle$ at $(1, 0, 1)$

b. $\mathbf{r}(t) = \langle \ln t, 2\sqrt{t}, t^2 \rangle$ at $(0, 2, 1)$.