Math 20550 Calculus III Tutorial **Name:** _____
February 4, 2016

Tutorial Worksheet

Show all your work.

1. A particle moves with position function $\mathbf{r}(t) = \langle \cos t, \sin t, \cos^2 t \rangle$. Find the tangential and normal components of acceleration when $t = \pi/4$.

2. Let C be the curve of intersection of the parabolic cylinder $x^2 = 2y$ and the surface $3z = xy$. Find the exact length of C from the origin to the point $(6, 18, 36)$.

3. Find the equation for the normal and osculating planes to the curves $\mathbf{r}(t) = (t - \frac{3}{2}\sin(t))\mathbf{i} + (1 - \frac{3}{2}\cos(t))\mathbf{j} + t\mathbf{k}$ at the point $(\pi, \frac{5}{2}, \pi)$.

4. Find the unit tangent, the unit normal, and the binormal vectors $\mathbf{T}$, $\mathbf{N}$ and $\mathbf{B}$ to the curve $\mathbf{r}(t) = \langle \sin 2t, \cos 2t, 3t^2 \rangle$ at $t = \pi$.

5. Find equations of the normal and osculating planes of the curve $\mathbf{r}(t) = \langle t^2, \ln t, t \ln t \rangle$ at the point $(1, 0, 0)$.

6. Find equations of the normal and osculating planes of the curve of intersection of the parabolic cylinders $x = y^2$ and $z = x^2$ at the point $(1, 1, 1)$