Math 352

Name:________________________________

Exam 2

1. [**12 points**] Let C be the space curve $\vec{x}(t) = (\cos 2t, \sin 3t, \sin 4t)$. Compute the curvature of C at the point $(1, 0, 0)$.

2. [**14 points**] Evaluate $\iint_S z\,dA$, where S is the portion of the cone $z = \sqrt{x^2 + y^2}$ in the range $0 < z < 3$.

3. [**12 points**] Find a constant k so that

$$\vec{X}(u, v) = \left(k\sqrt{u}\cos v,\ k\sqrt{u}\sin v,\ k\sqrt{u}\right)$$

is an equiareal parametrization of the cone $z = \sqrt{x^2 + y^2}$.

4. [**14 points**] The paraboloid $z = x^2 + y^2$ is rotated slightly so that its axis is the line $x = y = z$, with the vertex of the paraboloid staying fixed at $(0, 0, 0)$. Find parametric equations for the resulting surface.

5. [**18 points**] On a unit-speed space curve, $\vec{T}'(0) = (2, 0, 2)$ and $\vec{T}''(0) = (9, 7, 1)$. What is $\kappa'(0)$?

6. [**15 points**] Let P be the plane in $\mathbb{R}^4$ parameterized by

$$\vec{X}(u,v) \;=\; (u+5v,\ u-v,\ u+5v,\ u+7v).$$

Find a parametrization for the unit circle on P centered at the origin.

7. [**15 points**] Let $\vec{X} \colon \mathbb{R}^2 \to \mathbb{R}^3$ be the function

$$\vec{X}(u, v) \;=\; \bigl(uv,\, u^2 + 9v^2,\, u^2 + 3v^3\bigr)$$

Find all critical points of $\vec{X}$.