Math 210 E1 S92 — Calculus III — Exam #1 — Hanson — page 1 of 2

Show work on this sheet in 50 minutes (($5 \times 10 + 50 = 100$*)pts).*

Name ______________________________. *SocSecNo.* ________________________.

1. Reduce to standard form, Classify, and Sketch the Surface, $4x^2 + y^2 - z^2 - 2y + 1 = 0$.

2. Show that $\vec{v} = \vec{a} - \left(\vec{a} \cdot \vec{b}\right) \vec{b} / \left|\vec{b}\right|^2$ is Orthogonal to $\vec{b}$.

3. Find the Normal to and Vector Equation of the Plane passing through the three points $(1, 0, -1)$, $(2, 4, 5)$ and $(3, 1, 7)$.

4. Find the Vector Equation of the Line passing through the two points $(1, 3, -5)$ and $(-5, 6, -8)$.

5. Identify and Sketch the Surface given in Spherical Coordinates by $\rho \sin(\phi) = 3$.

6. Given the position vector $\vec{r}(t) = \cos(3t)\vec{i} + \sin(3t)\vec{j} + 4t\vec{k}$, find the

(a) Velocity

(b) Acceleration

(c) Speed

(d) Unit Tangent Vector

(e) Arclength when $\pi \leq t \leq 2\pi$

(f) Curvature

(g) Unit Normal Vector