MATH 210 **EXAM 1** **FALL 1992**

NAME: (PRINT) _____

SIGNATURE: _____

SSN: _____

Show your work in the space provided.

1. Let $\vec{u} = \langle 1, 3, -2 \rangle$ and $\vec{v} = \langle 4, 2, 1 \rangle$.

   a) Find the cosine of the angle θ between $\vec{u}$ and $\vec{v}$.

   b) Find the length of the projection of $\vec{v}$ on $\vec{u}$.

2. Reduce to standard form, classify, and sketch the surface $x^2 - 4x - 6y^2 + z^2 + 2 = 0$.

3. Find a vector equation of the line through $(2, 1, 3)$ and $(4, 5, 6)$. Then write the parametric equations of the line.

4. Let $P = (2, 0, 3)$, $Q = (1, 2, 0)$, and $R = (0, 0, 1)$.

   a) Find the equation of the plane through the points P, Q, and R.

   b) Find the distance from the point $S = (0, 3, 0)$ to the plane in part a).

5. Consider the curve given by

$$\vec{r}(t) = \cos t\ \vec{\imath} + \sin t\ \vec{\jmath} + 4t\ \vec{k}.$$

   a) Find the arc length from $t = \frac{\pi}{2}$ to $t = \pi$.

   b) Reparametrize the curve by arc length measured from the point where $t = 0$.

6. Given the position vector

$$\vec{r}(t) = \sin(2t)\vec{\imath} + \cos(3t)\vec{\jmath} + 2t\ \vec{k}$$

find the following:

a) Velocity =

b) Acceleration =

c) Speed =

d) Unit tangent vector =

e) Curvature =

f) Unit normal vector =