Name:

Mth 254, Midterm Examination February 7, 2012

Show your work to receive any credit. Circle your answers.

P	roblem	1	2	3	4	5	6	7	8	Total
P	ossible	12	12	12	14	12	14	12	12	100
	Score									

For problems 1, 2 and 3, let $\mathbf{v} = \langle 2, 0, \sqrt{5} \rangle$, and $\mathbf{w} = \langle 0, 2, \sqrt{5} \rangle$.

- 1. Find the vector projection of \mathbf{v} on \mathbf{w} .
- 2. Find the cosine of the angle between \mathbf{v} and \mathbf{w} .
- 3. Find the equation of the plane through the the point (1, -1, 2) in \mathbb{R}^3 that has normal vector perpendicular to both \mathbf{v} and \mathbf{w} .
- 4. (a) Find the vector equation of the line through (2, 2, 3) in the direction of the normal vector to the plane 3x + 2y 4z = 6.
 - (b) Find the distance from (2, 2, 3) to the plane 3x + 2y 4z = 6.
- 5. Set up an integral that gives the length of the curve $\mathbf{r}(t) = \langle t, 0, \frac{2}{3}t^{(3/2)} \rangle$ for $0 \le t \le 8$.
- 6. For the curve $\mathbf{r}(t) = \langle t, \sin t, 2\cos t \rangle$ find:
 - (a) the unit tangent vector $\mathbf{T}(t)$ when $t = \pi/2$.
 - (b) The normal component of acceleration, $a_{\mathbf{N}}(t)$, when $t = \pi/2$.
- 7. Find the curvature κ of the plane curve $y = \sin(2x)$ when $x = \frac{\pi}{4}$.
- 8. The acceleration of an object moving in three dimensional space is given by a(t) = (0, 4, -32) where the components are in ft/sec². If the initial position of the object is r(0) = (20, 10, 50) and the initial velocity is v(0) = (10, 10, 20), find an expression for the position at time t, r(t).