MATH 251: Quiz 2

June 4, 2015

Name: _____

1. Find the equation of the plane through the point $(0, 2, 1)$ with normal vector $\langle 2, 3, 2 \rangle$.

2. Find the equation of the plane through the points $(1, 2, 3)$, $(2, -1, 2)$ and $(-1, -1, -1)$.

3. For the vector-valued function $\vec{r}(t) = \langle 2e^t, t^3, \frac{1}{t} \rangle$, compute

(a) $\vec{r'}(t)$

(b) $\int_1^3 \vec{r}(t)\, dt$

4. Find the tangent vector to the curve $\vec{r}(t) = \langle t^4, e^t + 2, 2t^2 + 3t + 1 \rangle$ at the point $t = 2$.

5. For the curve $\vec{r}(t) = \langle \cos(4t), 3t, \sin(4t) \rangle$, compute

(a) the length of $\vec{r}(t)$ between $t = 0$ and $t = 3$.

(b) the curvature of $\vec{r}(t)$ at $t = 1$.

Possibly Helpful Formulas:

$$\vec{v} \times \vec{w} = \langle a_2b_3 - a_3b_2, a_3b_1 - a_1b_3, a_1b_2 - a_2b_1 \rangle$$

Equations for a Plane:

$$\vec{n} \cdot \langle x, y, z \rangle = d$$

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$$

$$ax + by + cz = d$$

for $\vec{n} = \langle a, b, c \rangle$ and $d = ax_0 + by_0 + cz_0$.

Arc Length (length of a curve) from a to t:

$$s(t) = \int_a^t ||\vec{r'}(u)|| \, du$$

Curvature formulas

$$\kappa(t) = \left|\left| \frac{d\vec{T}}{ds} \right|\right|$$

$$\kappa(t) = \frac{||\vec{r'}(t) \times \vec{r''}(t)||}{||\vec{r'}(t)||^3}$$