

Math 280 B

SECOND HOUR EXAM

NAME _____

General Notes:

1. **Show work.**
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam. Carry out any calculations to the point at which you would need a calculator (for example, to take the square root of a number) and leave it in that form.

Friday, Oct. 23, 2009
100 pts.

1. (10 Pts.) Identify, and give a rough sketch of the surface defined by $9x^2 + 9y^2 + 4z^2 = 36$

2. (15 pts.) given $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j} + 3t\hat{k}$, find

a. $\frac{d}{dt}\vec{r}(t) = \vec{v}(t) =$

b. $\|\vec{v}(t)\|$

c. $\int_0^{\frac{\pi}{4}} \vec{r}(t) dt$

3. (15 pts.) for the same function $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j} + 3t\hat{k}$ as problem (2)

a. Find the arc length from $t=0$ to $t=1$

b. Find the length function $s(t)$ for the length starting at $t=0$.

4. (15 pts.)

a. Define the Unit Tangent Vector \vec{T} and give a computation formula for it.

b. Find \vec{T} for $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j} + 3t\hat{k}$

5. (15 pts.)

a. Define the curvature \mathcal{K} of a vector function and give a formula for it.

b. Calculate the curvature of $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j} + 3t\hat{k}$ (it should be independent of t in this case)

6. (15 pts.)

a. Define the Principal Unit Normal vector \vec{N}

b. Calculate \vec{N} for $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j} + 3t\hat{k}$

7. (10 pts.)

a. Define the Binormal Vector \vec{B} of a curve.

b. $\frac{d\vec{B}}{ds} = -\tau\vec{N}$. What is τ called?

8. Some definitions (5 pts. each)

a. What is a boundary point?

b. When is a set X open?

dc When is a set X bounded?