

Name: \_\_\_\_\_

September 10<sup>th</sup>, 2014.  
Math 2401; Sections D1, D2, D3.  
Georgia Institute of Technology  
Exam 1

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. By signing my name below I pledge that I have neither given nor received help on this exam.

Pledged: \_\_\_\_\_

Problem	Possible Score	Earned Score
1	20	
2	20	
3	10	
4	20	
5	20	
6	10	
Total	100	

Remember that you must SHOW YOUR WORK to receive credit!

**Good luck!**

1. [20 pts.] Given the vectors  $\vec{v}_1 = \langle 1, 0, 2 \rangle$  and  $\vec{v}_2 = \langle -1, 2, 3 \rangle$ :

a). Find  $\vec{v}_1 \cdot \vec{v}_2$ .

b). Find  $\vec{v}_1 \times \vec{v}_2$ .

c). Find the angle between  $\vec{v}_1$  and  $\vec{v}_2$ . Give an exact answer.

d). Find a (simplified) component equation for the plane determined by the points  $(0, 0, 0)$ ,  $(1, 0, 2)$  and  $(-1, 2, 3)$ .

2. [20 pts.] Find parametric equations for the line that is tangent to the curve:

$$\vec{r}(t) = \left(\ln \frac{t}{3}\right) \vec{i} + \left(\frac{t-3}{t+6}\right) \vec{j} + \left(t \ln \frac{t}{3}\right) \vec{k},$$

at the point on the curve where  $t = 3$ .

3. [10 pts.] Express the vector  $\overrightarrow{P_1P_2}$  in the form  $a\vec{i} + b\vec{j} + c\vec{k}$ , where  $P_1$  is the point  $(4, -3, 8)$  and  $P_2$  is the point  $(-9, -9, 6)$ .

4. [20 pts.] Evaluate the integral:

$$\int_0^1 \left[ (6te^{3t^2}) \vec{i} + (6e^{-6t}) \vec{j} + 5\pi \vec{k} \right] dt.$$

Give exact answers.

5. [20 pts.] Given the curve:

$$\vec{r}(t) = \langle -\sqrt{2}e^t \cos(t), -\sqrt{2}e^t \sin(t), 2 \rangle,$$

find:

a). The unit tangent vector  $\vec{T}(t)$ .

b). The unit normal vector  $\vec{N}(t)$ .

c). The curvature  $\kappa$ .

6. [10 pts.] Consider the curve:

$$\vec{r}(t) = \langle 0, \cos^3(t), \sin^3(t) \rangle, \quad -\frac{\pi}{2} \leq t \leq 0.$$

Find the length of the curve on the given parameter domain.