MAT 397   CAL III   Section M007   Fall 2015

TEST 1

Your Name (please PRINT): _____

Student ID Number: _____

INSTRUCTIONS

- Fill in the above items.

- There is a total of 5 problems, for a maximum possible total value of 100 points. **Make sure you have all 6 test pages (this cover page + 5 test pages).** You are responsible to check that your test booklet has all 6 pages. Alert a proctor if your copy is missing any pages.

- **Show all your work.** Only minimal credit will be given for answers without supporting work.

- **Write your answer in the box** at the bottom of pages 2-6.

- **Use the back of test pages if additional space is needed**, and for scratch paper.

- **No calculators or other electronic devices; no outside notes; no outside tables** are allowed on this exam. Any use of calculators or electronic devices, or outside notes is a violation of the Academic Integrity Policy.

Do not write below this line

Pb. #	Max Points	Your Score
1	24	
2	14	
3	24	
4	20	
5	18	
Total	100	

1. (24 pts)   Consider the two vectors
$$\mathbf{a} = \langle 1, -1, 2 \rangle, \qquad \text{and} \qquad \mathbf{b} = \langle -1, -1, 4 \rangle.$$

(a) Find the **angle** between **a** and **b**.

(b) Find a vector that is **perpendicular** to both **a** and **b**.

(c) Find the **area** of the parallelogram determined by **a** and **b**.

Answer for part (a):
Answer for part (b):
Answer for part (c):

2. (14 pts) Find the **scalar** equation of the **plane** that goes through the point $(-1, 2, -2)$ and is **parallel** to the plane with equation $2x - y + 3z = \sqrt{6}$.

Answer:

3. (24 pts) The points P_1, P_2, P_3 and P_4 are given by the x, y, z coordinates $(1,0,0)$, $(0,0,1)$, $(0,2,0)$ and $(2,0,2)$ respectively.

(a) Write parametric equations of the line L_1 connecting P_1 and P_2.

(b) Write parametric equations of the line L_2 connecting P_3 and P_4.

(c) Determine whether L_1 and L_2 intersect, are parallel or skew and explain why.

Answer for part (a):

Answer for part (b):

Answer for part (c):

4. (20 pts) A curve is given by the following parametric equation:

$$\vec{r}(t) = 2\cos(2t)\hat{\mathbf{i}} + 2\sin(2t)\hat{\mathbf{j}} + 3t\hat{\mathbf{k}}$$
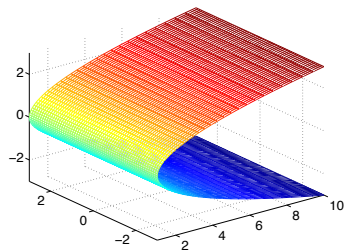
(a) Find its unit tangent vector $\hat{\mathbf{T}}(t)$.

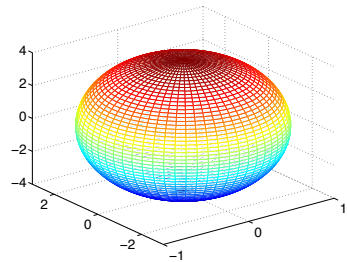(b) Find its principal unit normal vector $\hat{\mathbf{N}}(t)$.

Answer for part (a):
Answer for part (b):

5. (18 pts) Match the following functions with the given graphs and explain why.

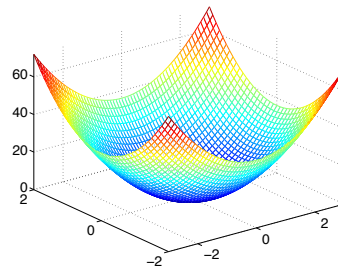$$(1)\, x^2 + \frac{y^2}{9} + \frac{z^2}{16} = 1 \qquad (2)\, z = 4x^2 + 9y^2 \qquad (3)\, x = z^2 + 1$$

(a)   (b)   (c)