

Name: \_\_\_\_\_ Section Number: \_\_\_\_\_

TA Name: \_\_\_\_\_ Section Time: \_\_\_\_\_

**Math 10C.**  
**Midterm Exam 2**  
**May 18, 2005**

*Turn off and put away your cell phone.*

*You may use a calculator, but no other electronic devices are allowed on this exam.*

*You may use one page of notes, but no books or other assistance on this exam.*

*Read each question carefully, answer each question completely, and show all of your work.*

*Write your solutions clearly and legibly; no credit will be given for illegible solutions.*

*If any question is not clear, ask for clarification.*

1. (4 points) For which value(s) of  $t$  are the vectors  $3\vec{i} + 2\vec{j} + t\vec{k}$  and  $2t\vec{i} + 4\vec{j} + t\vec{k}$  perpendicular?

#	Score
1	
2	
3	
4	
$\Sigma$	

2. (4 points) Suppose that for some differentiable function  $g(x, y)$ ,

$$g(1, 2) = 4, \quad g_x(1, 2) = -3, \quad g_y(1, 2) = 5.$$

(a) Find the local linearization of  $g$  near  $x = 1$  and  $y = 2$ .

(b) Approximate the value of  $g(1.02, 2.03)$ .

3. (4 points) Find a vector that is perpendicular to the vectors  $4\vec{i} + 3\vec{j} + \vec{k}$  and  $4\vec{i} + 6\vec{j} + \vec{k}$ .

4. (6 points) Let  $f(x, y) = x^2y^5$ . At the point  $(-1, 2)$ :

(a) Find a vector in the direction of maximum rate of change.

(b) Find a vector in the direction of minimum rate of change.

(c) Find a vector in a direction in which the rate of change is zero.