

MIDTERM I EXAM

MAT 205, Spring 03

To receive full or partial credit, you must show all your work and justify your reasoning. There are 5 problems, each worth 20pts.

NAME:

ID Number:

#1.	#2.	#3.	#4.	#5.	Total
-----	-----	-----	-----	-----	-------

1. Let $\mathbf{v} = (1, 1, 2)$, $\mathbf{w} = (2, -1, 1)$ be vectors in \mathbb{R}^3 .

(a). Find $\mathbf{v} \cdot \mathbf{w}$

(b). Find the cosine of the angle between \mathbf{v} and \mathbf{w} .

(c). Find a number s such that $\mathbf{v} - s\mathbf{w}$ is orthogonal to \mathbf{v} .

2. Let $F(t)$ be the vector function given by $F(t) = te^{-t}\mathbf{i} + t^2\mathbf{j} + te^{-2t}\mathbf{k}$. At what point is the tangent vector to the curve $F(t)$ horizontal, i.e. tangent to a plane parallel to the (x, y) plane.

3. Let $f(x, y) = x \cdot y$. Sketch the c -level curves of f in the (x, y) plane, for $c = 0, \pm 1, \pm 2$. Label each curve with the corresponding value of f .

Use this to either describe the graph of f in words, or sketch the graph of f .

4. Find the partial derivatives f_x , f_y and f_z of the function

$$f(x, y, z) = xy + 2yz + 3xz,$$

at the point $(1, 1, 1)$.

5. Find the equation of the tangent plane to the graph of the surface

$$z = f(x, y) = 3x + 4y,$$

at the point $(1, -1, -1)$.

What is the relation of this tangent plane to the graph of the surface itself?