

MARK BOX		
Problem	Points	
1	25	
2	25	
3	25	
4	25	
Total	100	

MATH 550 SPRING 1995 EXAM 1

NAME: \_\_\_\_\_

SSN: \_\_\_\_\_

Instructions:

- (1) To receive credit you must work in a logical fashion, SHOW ALL YOUR WORK, INDICATE YOUR REASONING, and when applicable put your answer on the line (or in the box) provided.
- (2) The “Mark Box” indicates the problems along with their points. Check that your copy of the exam has all of the problems.
- (3) Allowed are a calculator and the class handouts, as indicated on the syllabus. Not allowed are other notes and books.
- (4) This exam covers (from *Intro. to Vector Analysis* by Davis & Snider, 6<sup>th</sup> ed.) sections: 1.1 – 1.12, 1.14, 2.1 – 2.4, part of 3.1

1. Let  $\vec{A} = \langle 1, 2, 3 \rangle$  and  $\vec{B} = \langle -5, 1, 0 \rangle$ . Let  $\theta$  be the angle between  $\vec{A}$  and  $\vec{B}$ . Let  $\vec{A} = \vec{A}_{||} + \vec{A}_{\perp}$  where  $\vec{A}_{||}$  is parallel to  $\vec{B}$  and  $\vec{A}_{\perp}$  is perpendicular to  $\vec{B}$ . Find:

$$\begin{array}{ll}
 |\vec{A}| = & \cos \theta = \\
 |\vec{B}| = & \text{is } 0 \leq \theta \leq \frac{\Pi}{2} \text{ or } \frac{\Pi}{2} < \theta \leq \Pi? \text{_____} \\
 \vec{A} \cdot \vec{B} = & \vec{A}_{||} = \\
 \vec{A} \times \vec{B} = & \vec{A}_{\perp} =
 \end{array}$$

2. Find the equation of the plane  $\mathcal{P}$  that passes through the point  $(3, 4, -1)$  and is parallel to the vectors  $\vec{A} = \langle 2, 1, 1 \rangle$  and  $\vec{B} = \langle 1, 0, -3 \rangle$ .

ANSWER:  $\mathcal{P}$ : \_\_\_\_\_

3. A puffo moving through (2-D) space as position vector, as a function of time  $t$  :

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

Express the puffo's acceleration vector  $\vec{a}(t)$  as the sum of its unit tangent vector  $\vec{T}(t)$  and its unit principle normal vector  $\vec{N}(t)$  .

ANSWER:  $\vec{a}(t) =$  \_\_\_\_\_  $\vec{T}(t) +$  \_\_\_\_\_  $\vec{N}(t)$

where  $\vec{T}(t) =$  \_\_\_\_\_

and  $\vec{N}(t) =$  \_\_\_\_\_ .

4. The graph of the folium of Descartes with rectangular equation  $x^3 + y^3 = 3xy$  is shown below. Parametrize its loop. Hint: Let  $P = (x, y)$  be the point of intersection of the line  $y = tx$  with the loop.

ANSWER:  $\vec{R}(t) = \langle \underline{\hspace{2cm}}, \underline{\hspace{2cm}} \rangle$ .

where the domain of  $t$  is:  $\underline{\hspace{1cm}} t \underline{\hspace{1cm}}$ .