

MARK BOX		
Problem	Points	
1	30	
2	35	
3	35	
Total	100	

MATH 550 SPRING 1995 EXAM 2

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, 6th ed.) sections: 3.1 – 3.7 and 4.1 – 4.4.

1. Give an example of a nonconstant vector field $\vec{F}(\vec{v}) = \langle F_1(\vec{v}), F_2(\vec{v}), F_3(\vec{v}) \rangle$ with $\vec{F}: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ and $\text{div } \vec{F} = 0$.

2. Consider the vector field

$$\vec{F} = \left\langle \frac{x}{x^2 + y^2}, \frac{y}{x^2 + y^2}, z \right\rangle.$$

- a) The domain D of definition of \vec{F} is _____ .
- b) Can you use the “curl test” to determine whether \vec{F} is conservative in D ? Why or why not?
- c) Find a potential ϕ of \vec{F} . ANSWER: $\phi =$ _____ .

3. Consider the vector field

$$\vec{F} = \langle \sin x, y^2, e^z \rangle .$$

- a) The domain D of definition of \vec{F} is _____ .
- b) Is \vec{F} conservative in D ? Why or why not?
- c) Find the line integral $\int_C \vec{F} \cdot d\vec{R}$ where C is the helix from $(1, 0, 0)$ to $(1, 0, 4)$ given by $\vec{R}(t) = \langle \cos(2\pi t), \sin(2\pi t), 4t \rangle$. Hint: there is an easy way.....

answer: $\int_C \vec{F} \cdot d\vec{R} =$ _____ .