MATH 261 EXAM 4, Spring 2004

Simplify all answers. Show your work!

Name:

Score	
1	
2	
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Tot	

1. a) Let $f(x,y) = \ln(5x - 4y)$. Compute ∇f.

   Ans:_____.

   b) Let $f(x,y,z) = xe^{yz^2}$. Compute ∇f.

   Ans:_____.

2. Compute $\int_C x\, ds$, where C is the curve given by: $x = t,\ y = t^2,\ 0 \le t \le 1$

   Ans:_____.

3. Find f such that $\mathbf{F} = \nabla f$

   a) $\mathbf{F} = (e^{3y} + 10x)\mathbf{i} + (1 + 3xe^{3y})\mathbf{j}$

   Ans:_____.

   b) $\mathbf{F} = (2xy^3z^4)\mathbf{i} + (3x^2y^2z^4)\mathbf{j} + (4x^2y^3z^3)\mathbf{k}$

   Ans:_____.

4. Find $\int_C 3x^2 \sin 2y\, dx + (2x^3 \cos 2y + 3y^2)\, dy$, along the straight line joining $(0,1)$ and $(1,\pi/2)$

   Ans:_____.

5. Find $\oint_C \mathbf{F} \cdot d\mathbf{r}$, where: $\mathbf{F} = (x^3 - y^3)\mathbf{i} + (x^3 + y^3)\mathbf{j}$ and C is the boundary of the annulus $1 \le x^2 + y^2 \le 16$

   Ans:_____.

Extra Space

Part II.	Name:

6. Let $\mathbf{F} = 3x^2\mathbf{i} + (e^y \cos z)\mathbf{j} - (e^y \sin z)\mathbf{k}$. Compute

a) $\nabla \times \mathbf{F}$

Ans:_____.

b) $\nabla \cdot \mathbf{F}$

Ans:_____.

7. Find $\int\int dS$, where S is the part of the surface $z = xy$ bounded by the cylinder $x^2 + y^2 = 4$.

Ans:_____.

8. Identify the surfaces:

a) $\mathbf{r}(u, v) = (u + v)\mathbf{i} + (3u - 5v)\mathbf{j} + (u + 2v)\mathbf{k}$

Ans:_____.

b) $\mathbf{r}(u, v) = (u \cos v)\mathbf{i} + (u \sin v)\mathbf{j} + u\mathbf{k}$

Ans:_____.

9. Find $\int\int_S \nabla \times \mathbf{F} \cdot d\mathbf{S}$, where $\mathbf{F} = (x + 3y)\mathbf{i} + (4x - z)\mathbf{j} + (3y^2 z)\mathbf{k}$ and S is the part of the sphere $z = \sqrt{25 - x^2 - y^2}$, bounded by the cylinder $x^2 + y^2 = 9$

Ans:_____.

10. Find $\int\int_S \mathbf{F} \cdot d\mathbf{S}$, where $\mathbf{F} = (x^3)\mathbf{i} + (3yz^2)\mathbf{j} + (3y^2 z)\mathbf{k}$ and S is the surface of the solid bounded by $z = 4 - x^2 - y^2$ and $z = 0$

Ans:_____.

Extra space