

MATH 261 Final Exam, Fall 2005

Simplify answers. No work, no credit		Name:	Score		
1.	Let $\mathbf{A} = -2\mathbf{i} + 4\mathbf{j} + 5\mathbf{k}$ and $\mathbf{B} = 3\mathbf{j} - \mathbf{k}$ . Find: a) $\mathbf{A} \times \mathbf{B}$	b) The area of the $\triangle$ with edges $\mathbf{A}$ and $\mathbf{B}$	1	11	
			2	12	
			3	13	
			4	14	
			5	15	
			6	16	
			7	17	
			8	18	
Ans:_____.		Ans:_____.		9	19
2.	A plane $\mathcal{P}$ contains the points $P(1, 0, 0)$ and $Q(0, 2, 1)$ and $Q(1, 0, 3)$ , find: a) A normal to the plane $\mathcal{P}$ .	b) The equation of the plane.	10	20	
			Tot		
			Ans:_____.		Ans:_____.
3.	The planes $2x + 3y = 0$ and $y - 2z = 0$ intersect on a line $\mathcal{L}$ . Find: a) A direction vector for $\mathcal{L}$ .	b) The equation of $\mathcal{L}$ .	Ans:_____.		
			Ans:_____.		
4.	Identify the names of the graphs described by the following equations.		Ans:_____.		
	a) $\mathbf{r}(t) = \langle t^2, 3t, 4 \rangle$	Ans:_____.	b) $x^2 + 4y^2 - 8z^2 = 0$	Ans:_____.	
	c) $\mathbf{r}(t) = \langle 4 \cosh t, 3 \sinh t \rangle$	Ans:_____.	d) $4x^2 - 4y^2 - 9z^2 = 4$	Ans:_____.	
	e) $\mathbf{r}(t) = \langle \sin t, 5t, \cos t \rangle$	Ans:_____.	f) $x + 4y^2 - 9z^2 = 1$	Ans:_____.	
	Ans:_____.		Ans:_____.		
	Ans:_____.		Ans:_____.		
5.	A particle moves along the path $\mathbf{r}(t) = t^3\mathbf{i} + (t + 1)\mathbf{j} + (t^2/2)\mathbf{k}$ . Find the: a) Speed at $t = 1$ .	b) Acceleration at $t = 1$ .	Ans:_____.		
			Ans:_____.		
6.	c) Curvature at $t = 1$ .	d) Centripetal acceleration at $t = 1$	Ans:_____.		
			Ans:_____.		
Extra Space					

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7.	Let $z = f(x, y)$ where $x = r \cos \theta$ and $y = r \sin \theta$ , Find: a) $z_r$ .	b) $z_\theta$ .	
	Ans: _____.		Ans: _____.
8.	Let $f(x, y) = x^3 - 3xy^2$ . a) Compute $\nabla f$	b) Is $f(x, y)$ harmonic? Why?	
	Ans: _____.		Ans: _____.
9.	Let $f(x, y) = 2x^2 - y^2$ and $\mathbf{u} = -(1/2)\mathbf{i} + (\sqrt{3}/2)\mathbf{j}$ . Find a) $\nabla f(1, 3)$	b) A normal to the surface at $(1, 3, -7)$	
	Ans: _____.		Ans: _____.
10.	c) Find $D_{\mathbf{u}}f(1, 3)$	d) What is the largest rate of increase of $f$ at $(1, 3)$ ?	
	Ans: _____.		Ans: _____.
11.	Let $f(x, y) = 10 - 2x + 4y - x^2 - 4y^2$ . a) Find the critical points.	b) Classify the critical points.	
	Ans: _____.		Ans: _____.
12.	Let $z^3 + x^2z + \sin y = 1$ . a) Find $dz$	b) Find $z_x$	
	Ans: _____.		Ans: _____.



17. Find the surface area of  $x = 4yz$ , which is bounded by the cylinder  $y^2 + z^2 = 4$ .

Ans:\_\_\_\_\_.

18. Let  $\mathbf{F} = (y \sin z)\mathbf{i} + (x \sin z)\mathbf{j} + (xy \cos z)\mathbf{k}$  and  $C$  be the curve  $\mathbf{r} = (2 + t^2)\mathbf{i} + 3t^4\mathbf{j} + (\pi/2)t\mathbf{k}$ ,  $t \in [0, 1]$ .  
 a) Find  $f$  such that  $\mathbf{F} = \nabla f$ .  
 b) Compute  $\oint_C \mathbf{F} \cdot d\mathbf{r}$

Ans:\_\_\_\_\_.

Ans:\_\_\_\_\_.

19. Use Stoke's theorem to find  $\oint_C (3x^2y) dx + (\cos y - 3xy^2) dy + 2z dz$ , where  $C$  is the boundary of the surface  $z = 25 - x^2 - y^2$ ,  $z \geq 9$ .

Ans:\_\_\_\_\_.

20. Compute:  $\int \int_S (\nabla \times \mathbf{F}) \cdot d\mathbf{S}$ , where  $\mathbf{F} = 2y\mathbf{i} + (y - 6z)\mathbf{j} + (5x - 2y)\mathbf{k}$ , and  $S : x = \sqrt{16 - y^2 - z^2}$ ,  $x \geq 0$ .

Ans:\_\_\_\_\_.

Extra Space