

MATH 261 Final Exam, Fall 2004

Simplify answers. No work, no credit		Name:	Score	
1.	Given a force vector $\mathbf{F} = 2\mathbf{i} - \mathbf{j} + 4\mathbf{k}$ and a unit vector $\mathbf{T} = (1/3)\mathbf{i} - (2/3)\mathbf{j} + (2/3)\mathbf{k}$, compute: a) The angle between \mathbf{F} and \mathbf{T} . Ans:_____	b) The scalar component of \mathbf{F} along \mathbf{T} . Ans:_____	1	11
			2	12
			3	13
			4	14
			5	15
			6	16
			7	17
			8	18
2.	A plane \mathcal{P} contains the point $P(1, -1, 1)$ and the vectors $\mathbf{A} = \mathbf{i} + 4\mathbf{k}$ and $\mathbf{B} = 2\mathbf{j} + 3\mathbf{k}$. Find: a) A normal to the plane. Ans:_____	b) A <u>parametric</u> equation of the plane \mathcal{P} . Ans:_____	9	19
			10	20
			Tot	
3.	Given the planes $\mathcal{P}_1 : x + 2y + 3z = 6$ and $\mathcal{P}_2 : 2x - y = 1$, find: a) Find a point in the line of intersection. Ans:_____	b) The equation of the line of intersection. Ans:_____		
4.	Change from spherical to Cartesian coordinates and identify the surface: a) $\theta = \pi/4$. Ans:_____	b) $\rho = 6 \cos \phi$. Ans:_____		
5.	A particle moves along the path $\mathbf{r}(t) = (t^3/3)\mathbf{i} + (t^2/2)\mathbf{j} + t\mathbf{k}$, Find: a) The speed and acceleration at $t = 1$. Ans:_____	b) Curvature at $t = 1$. Ans:_____		
6.	Describe the level surfaces of $f(x, y, z) = x^2 + 4y^2 - z^2$: a) For $k > 0$. Ans:_____	b) For $k < 0$. Ans:_____		
Extra Space				

		Name:
7.	<p>Suppose $\mathbf{F} = (x^2 - 3y)\mathbf{i} + 6z\mathbf{j} + x^2\mathbf{k}$.</p> <p>a) Compute $\nabla \times \mathbf{F}$.</p> <p style="text-align: right;">Ans:_____.</p>	<p>b) Compute $\nabla \cdot \mathbf{F}$.</p> <p style="text-align: right;">Ans:_____.</p>
8.	<p>The temperature of a plate is given by $T(x, y, z) = x^2 + 3y^2z$. Find the rate of change of T at $P(1, 2, 2)$</p> <p>a) In the direction towards the origin.</p> <p style="text-align: right;">Ans:_____.</p>	<p>b) In the direction of maximum increase.</p> <p style="text-align: right;">Ans:_____.</p>
9.	<p>Let $z = f(x, y) = x^4 + 8xy + 2y^2 - 3$.</p> <p>a) Find the critical points.</p> <p style="text-align: right;">Ans:_____.</p>	<p>b) Find the maxima, minima and saddle points.</p> <p style="text-align: right;">Ans:_____.</p>
10.	<p>Let $xz^2 + z + y^3 = 3$. Find:</p> <p>a) z_x.</p> <p style="text-align: right;">Ans:_____.</p>	<p>b) $z_y(1, 1, 1)$.</p> <p style="text-align: right;">Ans:_____.</p>
11.	<p>Let $f(x, y) = y \ln \sqrt{x} + \tan y$, where $x = u \sin v$, and $y = u \cos v$. Use the <u>chain</u> rule to compute:</p> <p>a) f_u.</p> <p style="text-align: right;">Ans:_____.</p>	<p>b) f_v.</p> <p style="text-align: right;">Ans:_____.</p>
Extra space		

		Name:
12.	<p>A plate of density $\rho = x^2$ is bounded by $x = \sqrt{9 - y^2}$ and $x = 0$. Set up and evaluate (using a CAS) the integrals for</p> <p>a) $x_{c.m}$</p>	<p>b) I_y</p>
	Ans: _____.	Ans: _____.
13.	<p>Let $I = \int_0^2 \int_{y/2}^1 \frac{\sin x}{x} dx dy$.</p> <p>a) Reverse the order of integration</p>	<p>b) Evaluate the integral in part (a).</p>
	Ans: _____.	Ans: _____.
14.	<p>Find the the volume bounded by $z = 25 - x^2 - y^2$, and $z = x^2 + y^2 + 16$.</p> <p>a) Set up the triple integral.</p>	<p>b) Evaluate the integral.</p>
	Ans: _____.	Ans: _____.
15.	<p>Find the area of the surface $z = 4x^2 + 4y^2$, bounded by the cylinder $x^2 + y^2 = 1$</p> <p>a) Setup the integral.</p>	<p>b) Evaluate the integral.</p>
	Ans: _____.	Ans: _____.
16.	<p>Find the volume bounded by $x = \sqrt{25 - y^2 - z^2}$ and the cylinder $y^2 + z^2 = 9$</p> <p>a) Setup the integral.</p>	<p>b) Evaluate the integral.</p>
	Ans: _____.	Ans: _____.

		Name:
17.	Find the work done by the vector field $\mathbf{F} = (2xy + 3)\mathbf{i} + 2yz\mathbf{j} + (y^2 - 4)\mathbf{k}$ along the curve $\mathbf{r}(t) = \langle \cos t, \sin t, t \rangle$, where $0 \leq t \leq \pi/2$.	Ans: _____.
18.	Compute: $\int_C 3x^2y dx - 3xy^2 dy$, where C is the boundary of the region bounded by $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.	Ans: _____.
19.	Find $\int \int_S \mathbf{F} \cdot d\mathbf{S}$, where $\mathbf{F} = (4x^3z)\mathbf{i} + (4y^3z)\mathbf{j} + (3z^4)\mathbf{k}$ and S is the surface of the solid bounded by $z = \sqrt{9 - x^2 - y^2}$ and $z = 0$	Ans: _____.
20.	Find $\int \int (\nabla \times \mathbf{F}) \cdot d\mathbf{S}$, where $\mathbf{F} = [-3z + \ln(4 + x)]\mathbf{i} + \tan^{-1} y \mathbf{j} + [3x + \ln(4 + z)]\mathbf{k}$, and S is the surface $4x^2 + y^2 + 4z^2 = 4$ with $y \geq 0$.	Ans: _____.
Extra Space		