

MATH 261 Final Exam, Spring 2003

Simplify answers. No work, no credit		Name:	Score	
1.	Given a force $\mathbf{F} = 5\mathbf{i} - 3\mathbf{j}$ and a position vector $\mathbf{r} = 2\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ , compute: a) The torque $\mathbf{r} \times \mathbf{F}$ .         Ans:_____	b) $ \mathbf{r} \times \mathbf{F} $ .         Ans:_____	1	11
			2	12
			3	13
			4	14
			5	15
			6	16
			7	17
			8	18
2.	Given the point $P(1, -1, 5)$ and the line $L : \mathbf{r}(t) = \langle 3 - t, 3 + 2t, 2 + 5t \rangle$ , find: a) The direction vector of the line.         Ans:_____	b) The line through $P$ and $\parallel$ to $L$ .         Ans:_____	9	19
			10	20
			Tot	
3.	Write parametric equations for: a) The hyperbola $x^2 - y^2 = 9$ .         Ans:_____	b) The cone $x^2 + y^2 - z^2 = 0$ .         Ans:_____		
4.	Given the surface $\mathcal{S} : z = xy - 12$ and the point $P(2, 2, -8)$ a) A normal to $\mathcal{S}$ at $P$ .         Ans:_____	b) The equation of the tangent plane at $P$ .         Ans:_____		
5.	A particle moves along the path $\mathbf{r}(t) = \sqrt{2}t \mathbf{i} + e^t \mathbf{j} + e^{-t} \mathbf{k}$ . Find the: a) Speed at $(0,1,1)$ .         Ans:_____	b) Acceleration.         Ans:_____		
6.	c) Curvature at $(0,1,1)$ .         Ans:_____	d) Centripetal acceleration at $(0,1,1)$ .         Ans:_____		
Extra Space				

		Name:
7.	Suppose $f(x, y) = \ln(x^2 + y^2)$ . a) Compute $\nabla f$ .	b) Compute $df$ .
	Ans: _____.	Ans: _____.
8.	Let $f(x, y) = x^4y^3 - 3x^2 + y$ and $\mathbf{u}$ point in the direction given by the angle $\theta = \pi/6$ . Find a) The unit direction vector $\mathbf{u}$ .	b) $D_{\mathbf{u}}f(1, 1)$ .
	Ans: _____.	Ans: _____.
9.	Let $z = f(x, y) = xy - x^2 - y^2 - 2x - 2y + 7$ . a) Find the critical points.	b) Classify the critical points.
	Ans: _____.	Ans: _____.
10.	Let $xe^z + y^2z^3 = 6$ . Use implicit differentiation to find: a) $z_x$ .	b) $z_y$ .
	Ans: _____.	Ans: _____.
11.	Find the surface area in the first octant bounded by the plane $3x + 6y + 2z = 12$ .	
		Ans: _____.
	Extra space	

		Name:
12.	A plate of density $\rho = 5$ is bounded by $y = \sqrt{a^2 - x^2}$ and $y = 0$ . Set up the integrals for a) $y_{c.m}$	b) $I_z$
13.	Let $I = \int_0^3 \int_{y^2}^9 2ye^{x^2} dx dy$ . a) Reverse the order of integration	b) Evaluate the integral
Ans: _____.		Ans: _____.
14.	Use cylindrical coordinates to find the volume bounded by $z = 49 - x^2 - y^2$ , $z \geq 0$ , and $x^2 + y^2 = 9$ .	
		Ans: _____.
15.	Find the volume of the smaller region cut from the solid sphere $\rho \leq 2$ by the plane $z=1$ . a) Setup the integral in spherical coordinates.	b) Evaluate the integral.
Ans: _____.		Ans: _____.
16.	True or False? ___ a) If $\nabla \cdot \mathbf{F} = 0$ , then $\mathbf{F}$ is conservative. ___ b) If $\mathbf{F} = \nabla \times \mathbf{G}$ , then $\mathbf{F}$ is incompressible. ___ c) If $\int_C \mathbf{F} \cdot d\mathbf{r}$ is path independent, then $\nabla \times \mathbf{F} = 0$ . ___ d) If $\nabla \times \mathbf{F} = 0$ , then $\oint_C \mathbf{F} \cdot d\mathbf{r} = 0$ . ___ e) If $\text{bd}(S_1) = \text{bd}(S_2)$ then $\int_{S_1} \mathbf{F} \cdot d\mathbf{S} = \int_{S_2} \mathbf{F} \cdot d\mathbf{S}$	
Extra Space		

		Name:
17.	<p>Let <math>\mathbf{F} = (e^x \cos y + yz) \mathbf{i} + (xz - e^x \sin y) \mathbf{j} + (xy + z) \mathbf{k}</math> and <math>C</math> is the line segment joining <math>(0,0,0)</math> to <math>(-1, \pi/2, -2)</math></p> <p>a) Find <math>f</math> such that <math>\mathbf{F} = \nabla f</math>.</p>	<p>b) Compute <math>\int_C \mathbf{F} \cdot d\mathbf{r}</math></p>
	Ans: _____.	Ans: _____.
17.	<p>Compute: <math>\oint_C -y^3 dx + x^3 dy</math>, where <math>C</math> is the circle <math>x^2 + y^2 = 36</math></p>	
		Ans: _____.
19.	<p>Find <math>\int \int (\nabla \times \mathbf{F}) \cdot d\mathbf{S}</math>, where <math>\mathbf{F} = \langle 6y + z^2, 2x - y^3, 5y^2z \rangle</math> and <math>S : z = 36 - 4x^2 - 4y^2</math> with <math>z \geq 0</math>.</p>	
		Ans: _____.
20.	<p>Find: <math>\int \int_{\Sigma} \mathbf{F} \cdot d\mathbf{S}</math>, where <math>\mathbf{F} = 3z^2x\mathbf{i} + y^3\mathbf{j} + 3x^2z\mathbf{k}</math>, and <math>\Sigma</math> is bounded by <math>x = \sqrt{16 - z^2 - y^2}</math> and <math>x = 0</math>.</p>	
		Ans: _____.
	<p>Extra Space</p>	