

MATH 261 Final Exam, Spring 2004

Simplify answers. No work, no credit		Name:	Score	
1.	Given a force $\mathbf{F} = 3\mathbf{i} + 4\mathbf{k}$ and a position vector $\mathbf{r} = 2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$, compute: a) The work done by the force. Ans:_____	b) The torque $\mathbf{r} \times \mathbf{F}$. Ans:_____	1	11
			2	12
			3	13
			4	14
			5	15
			6	16
			7	17
			8	18
2.	A line \mathcal{L} passes through the the points $P(4, -3, 2)$ and $Q(5, 3, -4)$. Find: a) The direction vector of the line. Ans:_____	b) The equation of the line. Ans:_____	9	19
			10	20
			Tot	
3.	Write in Cartesian coordinates and thus identify the objects described by the parametric equations: a) $\mathbf{r}(t) = \langle 4, 3 \sin 2t, 2 \cos 2t \rangle$ Ans:_____	b) $\mathbf{r}(u, v) = \langle u \cosh v, u \sinh v, u^2 \rangle$ Ans:_____		
4.	Given the surface $\mathcal{S} : z = 3x^2 - 5y^2$ and the point $P(1, 1, -2)$ 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 $\mathbf{r}(t) = t^2 \mathbf{i} + 2t \mathbf{j} + \ln t \mathbf{k}$, with $1 \leq t \leq e$. Find the: a) The length of the curve. _____ Ans:_____	_____ Ans:_____		
6.	b) Curvature at $(1,2,0)$. Ans:_____	c) Centripetal acceleration at $((1,2,0))$. Ans:_____		
Extra Space				

		Name:
7.	Suppose $f(x, y) = \tan^{-1}(y/x)$. a) Compute ∇f .	b) Compute $\nabla \times \nabla f$.
	Ans:_____.	Ans:_____.
8.	Let $f(x, y, z) = x^4y^3 - 3x^2z^3$ and $\mathbf{v} = \langle 1, 2, 2 \rangle$ Find a) $D_{\mathbf{u}}f(1, 1, 2)$.	b) The maximum rate of change at $(1, 1, 2)$.
	Ans:_____.	Ans:_____.
9.	Let $z = f(x, y) = 2x^2 + 8xy + y^4$. a) Find the critical points.	b) Find the maxima, minima and saddle points.
	Ans:_____.	Ans:_____.
10.	Let $xz^2 + \sin(yz) = 2$. Find: a) dz .	b) z_x .
	Ans:_____.	Ans:_____.
11.	Find the surface area of the triangle with vertices at $(2, 0, 0)$, $(0, 3, 0)$ and $(0, 0, 4)$.	
		Ans:_____.
	Extra space	

		Name:
12.	A plate of density $\rho = y$ is bounded by $y = 4 - x^2$ and $y = 0$. Set up and evaluate (using a CAS) the integrals for a) $y_{c.m}$	b) I_z
	Ans:_____.	Ans:_____.
13.	Let $I = \int_0^2 \int_{y^2}^4 3y \cos x^2 dx dy$. a) Reverse the order of integration	b) Evaluate the integral in part (a).
	Ans:_____.	Ans:_____.
14.	Find the the volume bounded by $z = 25 - x^2 - y^2$, and $z = 9$. a) Set up the triple integral.	b) Evaluate the integral.
	Ans:_____.	Ans:_____.
15.	Find the volume cut from the cone $\phi = \pi/4$ by the sphere $\rho = 2a \cos \phi$. ($x^2 + y^2 + z^2 = 2az$) a) Setup the integral in spherical coordinates.	b) Evaluate the integral.
	Ans:_____.	Ans:_____.
16.	Find the area of the surface $z = x^2 - y^2$, bounded by the cylinder $x^2 + y^2 = 16$ a) Setup the integral.	b) Evaluate the integral.
	Ans:_____.	Ans:_____.

		Name:
17.	Let $\mathbf{F} = [\ln y + z/(1 + x^2)] \mathbf{i} + (x/y) \mathbf{j} + (\tan^{-1} x) \mathbf{k}$ and C is the line segment joining $(0,1,0)$ to $(1, e, 1)$ a) Find f such that $\mathbf{F} = \nabla f$.	b) Compute $\int_C \mathbf{F} \cdot d\mathbf{r}$
	Ans: _____.	Ans: _____.
18.	Compute: $\oint_C 3xy \, dx + 2x^2 \, dy$, where C is the boundary of the region bounded by $y = x$ and $y = x^2 - 2x$.	
		Ans: _____.
19.	Find $\iint (\nabla \times \mathbf{F}) \cdot d\mathbf{S}$, where $\mathbf{F} = \langle x + \sin yz, y^2z, z \rangle$ and $S : x = 25 - 4y^2 - 4z^2$ with $x \geq 9$.	
		Ans: _____.
20.	Find: $\iint_S \mathbf{F} \cdot d\mathbf{S}$, where $\mathbf{F} = (x^2 + y^2 + z^2)(x\mathbf{i} + y\mathbf{j} + z\mathbf{k})$, and S is bounded by $z = \sqrt{4 - x^2 - y^2}$ and $z = 0$.	
		Ans: _____.
	Extra Space	