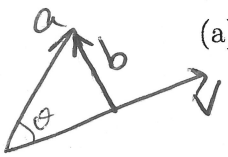
M E T U
Northern Cyprus Campus

	Calculus for Functions of Several Variables Quiz 1	
Code : *Math 120* Acad.Year: *2014-2015* Semester : *Fall* Date : *22.10.2014* Time : *18:45* Duration : *25 minutes*	Last Name: List No: Name: Signature: Student No:	
	4 QUESTIONS 2 PAGES TOTAL 16 POINTS	
1(4) 2(4) 3(4) 4(4)	KEY	

Show your work! No calculators! Please draw a box around your answers!
Please do not write on your desk!

1. (2+1+1 = 4 pts.) Let P be the point $(8,2,2)$ and the line L with parametric equations $x(t) = 1+t$, $y(t) = 1-2t$, $z(t) = 2t$. Notice that the point $Q = (1,1,0)$ is on this line. Now let $\mathbf{a} = \vec{QP}$ and $\mathbf{v}$ be a direction vector of L. $a = \langle 7,1,2\rangle$ $v = \langle 1,-2,2\rangle$



(a) Find the vector projection of $\mathbf{a}$ onto $\mathbf{v}$, i.e., $\text{Proj}_{\mathbf{v}}\,\mathbf{a}$.

$$\text{Proj}_v a = \frac{a\cdot v}{v\cdot v}\cdot v = \frac{7-2+4}{1^2+2^2+2^2}\cdot v = \frac{9}{9}v = v = \langle 1,-2,2\rangle$$

(b) Find the projection of $\mathbf{a}$ orthogonal to $\mathbf{v}$, i.e., $\text{Proj}_{\mathbf{v}}^{\perp}\,\mathbf{a}$. $= b$

$$b = a - v = \langle 7,1,2\rangle - \langle 1,-2,2\rangle = \boxed{\langle 6,3,0\rangle}$$

(c) Find the length of $\text{Proj}_{\mathbf{v}}^{\perp}\,\mathbf{a}$. $= \sqrt{6^2+3^2} = \sqrt{2^2 3^2+3^2} = \boxed{3\sqrt{5}}$

Congratulations : You just found the distance of the point P to the line L.

2. (4 × 1 = 4 pts.) Determine whether the following statements in Cartesian 3−space are true or false. Indicate your answers with the words **TRUE** or **FALSE** to the left of the question. No explanations required.

FALSE • Two lines either intersect or are parallel.

TRUE • Two lines perpendicular to a plane are parallel.

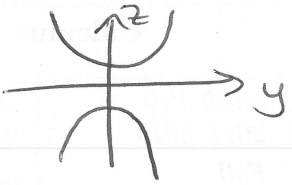
FALSE • Two planes parallel to a line are parallel.

TRUE • Two planes perpendicular to a line are parallel.

3. $(4 \times 1 = 4$ pts.) Consider the level surface $-x^2 + 2y^2 - 3z^2 = -5$.

- Sketch the slice for $x = 0$ and name the curve.

$x=0 \Rightarrow 2y^2 - 3z^2 = -5$

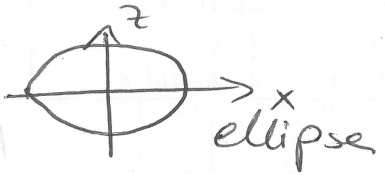


hyperbola

- Sketch the slice for $y = 0$ and name the curve.

$y=0 \Rightarrow -x^2 - 3z^2 = -5$

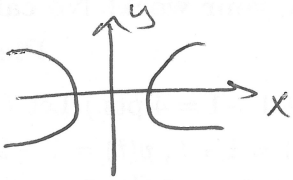
$\Rightarrow x^2 + 3z^2 = 5$



ellipse

- Sketch the slice for $z = 0$ and name the curve.

$z=0 \Rightarrow -x^2 + 2y^2 = -5$



hyperbola

- What is the full technical name for the quadric surface $-x^2 + 2y^2 - 3z^2 = -5$?

(elliptic) hyperboloid of one-sheet

4. $(2 \times 2 = 4$ pts.) Let $f(x, y) = y\, e^{2xy} + x^y$. Find the following partial derivatives.

(a) $\dfrac{\partial f}{\partial x} = y \cdot e^{2xy} \cdot 2y + y \cdot x^{y-1}$

(b) $\dfrac{\partial f}{\partial y} = 1 \cdot e^{2xy} + y \cdot e^{2xy} \cdot 2x + x^y \cdot \ln x$