

GEORGIA TECH

SCHOOL OF MATHEMATICS

MATH 2401

CALCULUS III
Quiz # 3
September 13th, 2012

First Name : _____

Last Name : _____

1. An point particle moves at constant speed.

(Hint : the speed is the length of the velocity vector.)

(a) Show that its acceleration \vec{a} remains perpendicular to the velocity vector \vec{v} .

(b) Express the curvature of the trajectory in terms of $v = \|\vec{v}\|$ and $a = \|\vec{a}\|$

$$\kappa =$$

2. A point particle moves with a constant acceleration \vec{a} . Show that the trajectory lies entirely in some plane. Find a vector equation for the plane.

(Hint : use initial conditions for the position and the velocity.)

3. Give the domain and the range of the function $f(x, y) = \ln(1 - xy)$

4. Given that a planet moves in a plane, its motion can be described both with cartesian coordinates (x, y) or with polar coordinates (r, θ) if the sun is at the origin. Give the expression of the kinetic energy $E = (1/2)m\|\vec{v}\|^2$ of the planet in each of these two systems of coordinates
(*Hint : express it in terms of the time derivative of the coordinates.*)

$$E =$$