

CALCULUS III

NAME \_\_\_\_\_

EXAM II

Rec. Instr. \_\_\_\_\_

SPRING 1997

Rec. Time \_\_\_\_\_

TO RECEIVE CREDIT YOU MUST SHOW YOUR WORK.

(20) 1. An object is moving in 3-space according to the parametric equations  $x = \cos t$ ,  $y = \sin t$  and  $z = 4t^2$ . Find as functions of time  $t$

a) unit tangent vector  $\vec{T}$ .

b) tangential component of acceleration  $a_T$ .

Now at  $t = \frac{\pi}{2}$  seconds find

c) curvature  $\kappa$ .

d) normal component of acceleration  $a_N$ .



(10) 3. An object is moving in the plane along the curve  $y = 2 - x^2$  from left to right. It is moving at a constant speed of 3 ft/sec.

a) Find  $a_T$  and  $a_N$  at the point  $(x, 2 - x^2)$ .

b) Find the velocity vector and the acceleration vector when the object is at the point  $(0, 2)$ .

(15) 4. As accurately as you can sketch the surfaces in 3- space determined by the following equations

a)  $y = x^2$

b)  $z = 4 - x^2 - y^2$

c)  $z = \sqrt{x^2 + y^2}$

NAME \_\_\_\_\_

page 5

(10) 5. Find the equation of the plane which is tangent to the surface  $z = 4 - x^2 - y^2 + 3xy$  at the point  $(2, 1, 5)$ .

NAME \_\_\_\_\_

page 6

(15) 6. Find all points on the surface  $z = y(x^2 + 2x - 3) - \frac{y^2}{2}$  at which the tangent plane is horizontal.

NAME \_\_\_\_\_

page 7

(10) 7. Calculate all the second partial derivatives of the function  
 $f(x, y) = e^{xy^2}$ .