

Math 126 C - Spring 2010  
Mid-Term Exam Number Two  
May 13, 2010

Name: \_\_\_\_\_

Student ID no. : \_\_\_\_\_

Signature: \_\_\_\_\_

Section: \_\_\_\_\_

1	10	
2	10	
3	20	
4	10	
Total	50	

- Complete all questions.
- You may use a scientific calculator during this examination; graphing calculators and other electronic devices are not allowed and should be turned off for the duration of the exam.
- If you use trial-and-error, a guess-and-check method, or numerical approximation when an exact method is available, you will not receive full credit.
- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

1. A particle moves along a curve in the  $xy$ -plane so that its position vector is

$$\vec{r}(t) = \langle t + \cos t, t - \sin t \rangle$$

for  $t \geq 0$ . Assume  $t$  is in seconds, and coordinates are in centimeters.

(a) Find the speed of the particle at time  $t = \pi$ .

(b) There are infinitely many times  $t$  when the velocity vector and the acceleration vector for this particle are orthogonal. Give one of these times.

2. Find the curvature of the curve

$$x = t^2, y = 1 - t, z = 1 - t^2$$

at the point  $t = 3$ .

3. Let

$$f(x, y) = \frac{1}{x} + \frac{1}{y} + x + y.$$

(a) Find a point on the surface  $z = f(x, y)$  where the tangent plane is parallel to the plane  $48x + 6y + 2z = 7$ .

(b) Find and classify all critical points of the surface  $z = f(x, y)$ .

4. Let  $R$  be the region in the first quadrant of the  $xy$ -plane bounded by  $y = 6 - x$ ,  $y = 6 - 2x$ , and the  $x$ -axis.

Express the volume of three-dimensional space lying above  $R$  and below the surface

$$z = xy$$

as **one** iterated double integral.