

Math 126 C - Spring 2009
Mid-Term Exam Number Two
May 14, 2009

Name: _____

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

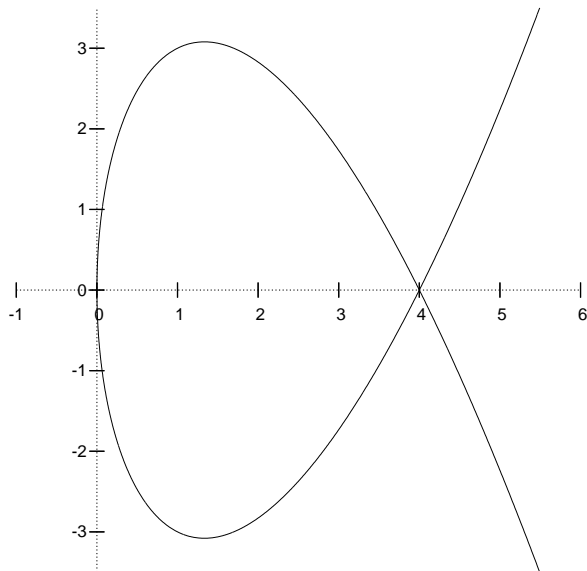
- Complete all questions.
- You may use a scientific, non-graphing calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
- If you use a trial-and-error or guess-and-check method when an algebraic method is available, you will not receive full credit.
- You may use one 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. The curve $y = x^x$ has one local extremum. Find the curvature at that point.

2. An object moves so that its position at time t is given by

$$\vec{r}(t) = \langle t^2, t^3 - 4t, 0 \rangle.$$

A portion of its path is shown below.



Find all times when the object's velocity vector is orthogonal to its acceleration vector.

3. Let

$$z = xe^y + y \sin x + \frac{x}{y}.$$

(a) Find $\frac{\partial z}{\partial x}$.

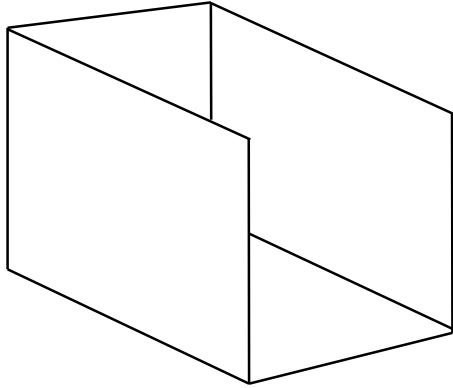
(b) Find $\frac{\partial z}{\partial y}$.

4. You wish to build a four-sided box like the one shown in the figure, with three rectangular sides perpendicular to a rectangular base.

You want the box to have a volume of 100 cubic centimeters.

If all sides are to be made from the same thin material, what dimensions will minimize the amount of material used?

Be sure to justify your answer using the Hessian (i.e., the second derivatives test).



5. Find the volume of the solid under the surface $z = xy^2$ and above the triangle with vertices $(0, 0)$, $(0, 5)$ and $(2, 3)$.