Math 126 E - Spring 2012
Mid-Term Exam Number Two
May 17, 2012

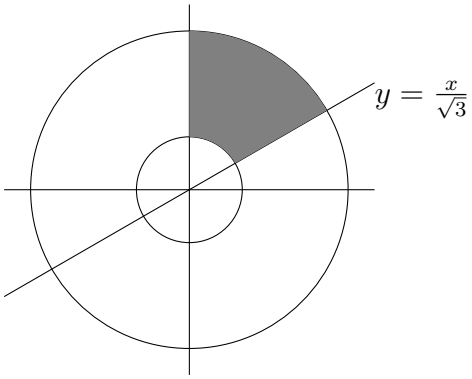
Name: _____ Student ID no. : _____

Signature: _____ Section: _____

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

- Complete all five questions.
- Show all work for full credit.
- All answers should be in exact form.
- You may use a scientific calculator during this examination. Graphing calculators are not allowed. Also, other electronic devices are not allowed, and should be turned off and put away 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, double-sided, hand-written 8.5 by 11 inch page of notes. Write your name on your notesheet and turn it in with your exam.
- You have 50 minutes to complete the exam.

1. Let R be the region in the first-quadrant bounded by the y-axis, the circle $x^2 + y^2 = 1$, the circle $x^2 + y^2 = 9$ and the line $y = \dfrac{x}{\sqrt{3}}$.



Find the mass of the lamina that occupies the region R and has density function $\rho(x, y) = xy^3$.

2. Find and classify all critical points of the surface

$$z = f(x, y) = (x^2 + y^2)e^{-x}.$$

3. A particle starts at the origin with initial velocity

$$\vec{v}(t) = \vec{i} + \vec{j} - 2\vec{k}.$$

The particle's acceleration at time t is given by

$$\vec{a}(t) = e^t\,\vec{i} - \vec{j} + e^{-t}\,\vec{k}.$$

(a) Determine the location of the particle at time $t = 10$.

(b) Give all locations where the particle's path intersects the xz-plane.

4. Let $z = f(x, y) = e^x \sin y + xy$. Suppose initially that $x = 0$ and $y = \pi$. Suppose x and y then change. Use a linear approximation to estimate the change in y if x increases by 0.1 and z increases by 0.1.

5. Evaluate the double integral

$$\int_{-2}^{2} \int_{x^2+1}^{5} e^{(y-1)^{3/2}} \, dy \, dx$$

by reversing the order of integration.