Math 126, Section E, Spring 2009, Midterm I

April 21, 2008

Name

TA/Section

Instructions.

- There are 4 questions. The exam is out of 40 points.

- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting.

- You may use a calculator which does not graph and which is not programmable. Even if you have a calculator, give me exact answers. ($\frac{2\ln 3}{\pi}$ is exact, 0.7 is an approximation for the same number.)

- **Show your work**. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. If you continue at the back of a page, make a note for me. Please $\boxed{\text{BOX}}$ your final answer.

Question	points
1	
2	
3	
4	
Total	

1. Find the line of intersection of the two planes $x - 3y + z = 9$ and $-x + 4y = 4$. Give your answer

   (a) As a vector function.

   (b) As a parametric curve.

   (c) With symmetric equations.

2. Find the angle of intersection of the two curves $\mathbf{r}_1(t) = < t^3, 2t^2 + 1, 2t + 3 >$ and $\mathbf{r}_2(s) = < s - 4, s - 3, s - 1 >$.

3. Given the points $A(1, 2, 3)$, $B(0, 0, 5)$, $C(2, 3, 0)$ and $D(2, 0, 1)$:

(a) Find the equation of the plane containing the three points A, B, and C. Hint: Check you answer to see A, B and C are on your plane! (4 points)
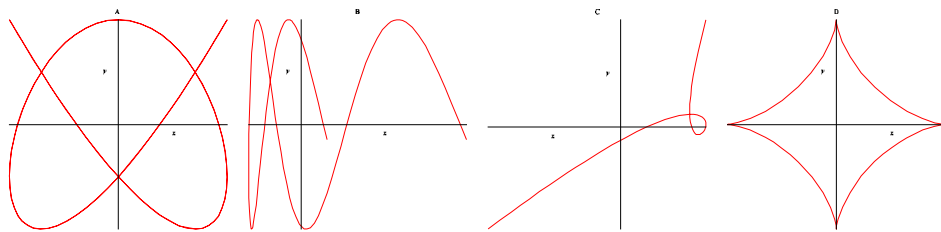
(b) What is the area of the triangle ABC? (1 point)

(c) Find the distance from point D to the plane in part (a) (4 points)

(d) If you draw a perpendicular line from point D to the plane, where does it intersect the plane? (1 point)

4. (a) Match the following parametric curves with their graphs.

1. $x = \sin^3 t, y = \cos^3 t$
2. $x = t^2 - 4t - 20, y = \cos t$
3. $x = \sin(3t), y = \cos(4t)$
4. $x = t^3 - 4t^2 + 50, y = t^3 - 5t + 1$

(b) Find the equation of the tangent line to $\mathbf{r}(t) = \langle \sin(3t), \cos(4t) \rangle$ at the point $(\frac{\sqrt{2}}{2}, -1)$.

(c) Determine if is concave up or concave down at the point $(\frac{\sqrt{2}}{2}, -1)$. Show your work. Use the appropriate graph above to verify your answer, not to find it!