MATH 307 First Midterm

October 2, 2013

Name: _____ **ID:** _____

Question:	1	2	3	4	5	Total
Points:	15	15	15	15	15	75
Score:						

There are 5 problems on 6 pages in this exam (not counting the cover sheet). Make sure that you have them all.

You may use a calculator if you wish, provided your calculator does not do calculus. However, it is unlikely to be of much help.

Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. **Books, extra papers, and discussions with friends are not permitted.** If you wish to use your psychic abilities to read my mind for the answers, you may do so. However, remember that I may be deliberately thinking of the *wrong* answers during the test.

You have more time than I think you need, but less time than you probably want, to complete this exam.

When you complete this exam, if there is sufficient time it is strongly recommended that you go back and reexamine your work, both on this exam and in your life up until now, for any errors that you may have made.

10 pts. 1. (a) Find line of intersection between the two planes

$$5x - 3y + z = 10 \quad \text{and} \quad 2x + 4y - z = -3.$$

5 pts. (b) Find the cosine of the minimum angle between the two planes.

15 pts. 2. Find the minimum distance between the two lines

$$\boldsymbol{\ell}(t) = \langle 1 + t, 1 + t, 2 + t \rangle \qquad \text{and} \qquad \mathbf{m}(s) = \langle 3 + 2s, 1 + s, 1 + 2s \rangle.$$

10 pts. 3. (a) Find the inverse of the matrix $A = \begin{pmatrix} 1 & 1 & 0 \\ 4 & 0 & 1 \\ 3 & 2 & 0 \end{pmatrix}$, if it exists. If it doesn't exist, justify your answer.

5 pts. (b) Solve the system of equations

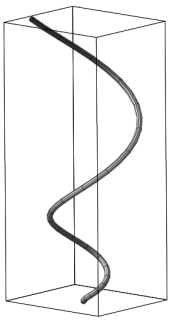
$$x + y = u, \qquad 4x + z = v, \qquad 3x + 2y = w,$$

for x, y, and z in terms of u, v, and w. If there is no solution, justify your answer.

15 pts. 4. Arthur Tisst is making a sculpture to put on display in the Simons Center Gallery. Art is planning to bend a platinum rod in the shape of the curve

$$\mathbf{R}(t) = \langle 3\cos(t) + 3t\sin(t), 3\sin(t) - 3t\cos(t), t^2 \rangle, \quad 0 \leq t \leq 4\pi.$$

What is the length of the rod (t is measured in cm) that he needs to make his sculpture?



10 pts. 5. (a) Write the equation of the plane tangent to the surface $z = f(x, y) = 2x^2 + 4xe^{xy}$ at $x = 1, y = 0$.

5 pts. (b) Use your answer to the above to estimate the value of $f(1.02, -0.1)$

This page was once a tree, and once it was blank. Now it is neither. You can make it less blank if you like. Turning it back into a tree is more effort, but also more worthwhile.