# Math 126 - Fall 2012
# Exam 1
# October 18, 2012

Name: ______________________________

Section: ______________________________

Student ID Number: ______________________________

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- You are allowed to use a scientific calculator (**NO GRAPHING CALCULATORS**) and one **hand-written** 8.5 by 11 inch page of notes. Put your name on your sheet of notes and turn it in with the exam.
- Check that your exam contains all the problems listed above.
- Clearly put a box around your final answers and cross off any work that you don't want us to grade.
- Show your work. The correct answer with no supporting work may result in no credit. Guess and check methods are not sufficient, you must use appropriate methods from class.
- Unless otherwise indicated, your final answer should be given in exact form whenever possible and correct to two digits if given as a decimal.
- There may be multiple versions of the exam. Any student found engaging in academic misconduct will receive a score of 0 on this exam (we take this very seriously, if you are found cheating you will at least get academic probation or you may be expelled from school).
- You have 50 minutes to complete the exam.
START BY LOOKING THROUGH ALL THE PROBLEMS AND USE YOUR TIME WISELY.
Check your time after you complete each problem and manage your time accordingly. Remember that significant partial credit may be given to correct work, so show me what you know!
**SPEND NO MORE THAN 10 MINUTES PER PAGE!**

GOOD LUCK!

1. (14 pts)

(a) Consider the line, $L$, that goes through the point $(0,0,0)$ and is orthogonal to the plane $2x - 3y + z = 5$. Find all $(x, y, z)$ points of intersection of the line $L$ and the surface $x^2 - \frac{7}{2}x + y^2 = 11z^2 + 4$.

(b) Consider the line, $L_1$, that is given by the parametric equations $x = 13 + 2t$, $y = 5 - t$, $z = 3t$ and the line, $L_2$, that goes through the points $(0,1,0)$ and $(5,2,1)$. Find the $(x, y, z)$ point of intersection of these lines, or show why the lines don't intersect.

2. (12 points) For all parts below, consider the three points $A(2, 0, 2)$, $B(2, 5, 1)$ and $C(3, -2, 5)$.

(a) Find the angle $\angle BAC$. (Give your answer rounded to the nearest degree)

(b) Find the area of the triangle $ABC$.

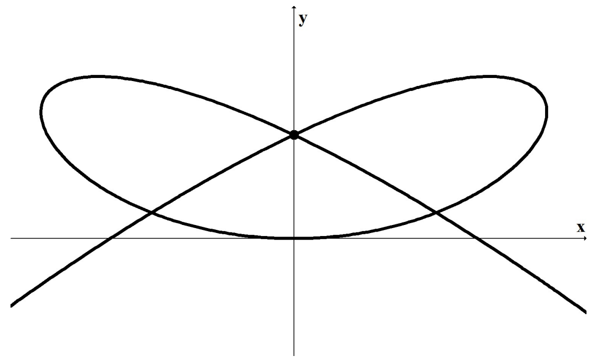
(c) Find the equation of the plane containing $A$, $B$, and $C$.

3. (12 pts)

(a) Consider the 'pretzel looking' parametric curve given by the equations

$$x = t^3 - 4t, \;\; y = 5t^2 - t^4.$$

The curve intersects the *positive* $y$-axis at the same $y$-intercept twice.
Find the two different tangent slopes at this point.




(b) Consider the polar curve given by the equation $r = 5 - \sin(\theta^2 - 2\theta)$. The curve has only one positive $x$-intercept. Find the equation for the tangent line at this positive $x$-intercept. (Your answer should be in terms of $x$ and $y$).

4. (12 points) The motion of a particular fly in three-dimensions is described by the vector position function $\mathbf{r}(t) = \langle \cos(\pi t), t^3 - 1, \sin(\pi t) \rangle$.

   (a) Eliminate the parameter and give the name of the surface of motion.

   (b) Find the equation for the tangent line to the curve at $t = \frac{1}{2}$. And determine the $(x, y, z)$ point of intersection of this tangent line with the $xz$-plane.