Math 126 - Spring 2013
Exam 1
April 25, 2013

Name: _____

Section: _____

Student ID Number: _____

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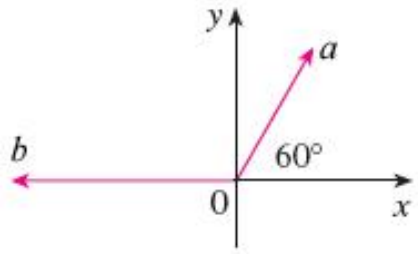
- There are 4 pages of questions. Make sure your exam contains all these questions.
- You are allowed to use a scientific calculator (**no graphing calculators and no calculators that have calculus capabilities**) and one **hand-written** 8.5 by 11 inch page of notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.** Give exact answers wherever possible.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There may be multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board. In such an instance, you will be force to meet in front of a board of professors to explain your actions.
  DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
  WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
- You have 50 minutes to complete the exam. Budget your time wisely.
  SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

1. (11 points)

(a) The forces **a** and **b** are the pictured. If $|\mathbf{a}| = 80$ N and $|\mathbf{b}| = 100$ N, find the angle the **resultant** force makes with the positive x-axis.
(Give your answer rounded to the nearest degree).



(b) Find the center and radius of the sphere with points $P(x, y, z)$ such that the distance from P to $A(0, 0, 2)$ is triple the distance from P to $B(0, 0, 0)$.

2. (12 pts)

(a) Find the equation for the plane that contains the line $x = t$, $y = 1 - 2t$, $z = 4$ and the point $(3, -1, 5)$.

(b) Consider the line L_1 that goes through the points $(-3, 3, 0)$ and $(-1, 4, 6)$ and the line L_2 that is given by $x = 2 + t$, $y = 3 - 2t$, $z = 19 + 7t$. These lines are not parallel.
Are L_1 and L_2 intersecting or skew? Justify your answer by either finding the point of intersection or showing that there is no intersection point.

3. (14 pts)

(a) Find a vector $\mathbf{v}$ such that
1. $\mathbf{v}$ is parallel to the tangent line to $x = 6\ln(t-4)$, $y = t^2 - 3t$ at the point $(0, 10)$, and
2. $|\mathbf{v}| = 5$.

(b) The polar curve $r = 2 + \cos(3\theta)$ intersects the negative y-axis at only one point, P. Find the equation for the tangent line to the curve at this point P.
(Put your answer in the form $y = m(x - x_0) + y_0$).

4. (13 pts) Consider the vector function $\mathbf{r}(t) = \langle t\cos(3t), t^2, t\sin(3t)\rangle$.

   (a) Describe the surface of motion for the resulting parametric curve.
   (Eliminate the parameter and give the specific name of the surface of motion).

   (b) Find the parametric equations for the tangent line at $t = \pi$.

   (c) Find the curvature at $t = 0$.