Possible Projects for Students Wanting Honors Credit in Math 3330

You should choose one of the following topics for your project (or create one that I approve before Oct 15, 2013), and write an essay with that topic as your title. Whatever you choose, it should be typed (preferred) or handwritten, at least 3 pages, font size at most 12 point, margins at most 1 inch, lines spaced at most 1.5 lines apart.
Due dates: **outline due Thursday Oct 24**, 2013, **final version due Thursday Nov 21**, 2013.
Note the comment below about plagiarism.

1. How Linear Algebra arises in Physics
2. How Linear Algebra arises in Engineering
3. How Linear Algebra arises in Economics
4. How Linear Algebra arises in X (where X is an applied field of your choice).

For each of the above topics, you should give a few (or more) specific examples, with a few (or more) lines of **mathematics in the description** of each example. You should also include some of the history behind each example.

5. Use of Linear Algebra in Computer Graphics

   This essay should include linear transformations and an explanation that translation in 2-space is not a linear transformation. The way to `write' translation as a linear transformation uses the mathematical notion of projection and homogeneous coordinates; so the use of these should be described. See, for example, David C. Lay's Book ``Linear Algebra and its Applications, 3^{rd} Ed.''

6. Hilbert Spaces

   This essay should include what is a Hilbert space in digestible language, some applications of Hilbert spaces, and some history of how they came to be used.

7. When a Matrix cannot be Diagonalized Some matrices cannot be diagonalized. You should describe what can be done instead of diagonalization to try to change the matrix to one that is as close to diagonal as possible.

   Find an ``almost diagonal'' matrix that represents the same linear transformation as represented by the matrix

   $$\begin{pmatrix} 7 & -2 & 8 \\ 0 & 3 & 0 \\ -4 & 1 & -5 \end{pmatrix}$$

   and explain how you arrive at your matrix. Give some applications of this process.

8. Pick a topic from the website:
   http://wps.aw.com/aw_lay_linearalg_updated_3/37/9501/2432316.cw/content/index.html
   and write about it in the spirit of what is described in the above topics.

You should cite your sources of information (preferably at the end of your essay), and reword the information in your OWN words; this means you need to do more than merely change the odd word here and there. Also, the amount of quoted text (even if cited) should constitute no more than 10% of your essay. See the website of the Office for Student Affairs for more information, or consult the honors college.