Matrices and Linear Transformations  
Homework Assignment 1  
Due on Friday, September 5, at the start of class.

Your homework should have the cover sheet posted on Blackboard. If you use several sheets, please staple them. The problems should be written neatly and in the order they were assigned.

Problem A. Find
\[ \text{Re} \, \frac{2 - i}{3 + 2i} \quad \text{and} \quad \text{Im} \, \frac{1 + 2i}{3 - i}. \]

Problem B.  (a) Write the two polar forms of \( 1 + \sqrt{3}i \).
(b) Write \( e^{-i\pi/4}, e^{i\pi/2} \) and \( e^{3i\pi} \) in the form \( a + ib \), where \( a \) and \( b \) are real.

Problem C. Solve the equation \( z^2 + 2z + 26 = 0 \).

Problem D. Suppose that matrices \( U \) and \( V \) are both \( m \times n \) echelon forms. Is it always true that \( U + V \) is an echelon form as well? If yes, prove it. If no, give a counterexample.

Problem E. First reduce the system to upper triangular form, then solve it.
\[
\begin{align*}
   x + 2y - iz & = 6 + i, \\
   2ix + y & = 2i, \\
   x - z & = 1.
\end{align*}
\]

Problem F. Reduce the system to echelon form. How many solutions are there? Explain.
\[
\begin{align*}
   2x + y - z + w & = 4, \\
   4x - y + 2z + w & = 0, \\
   6x + z + 2w & = 5.
\end{align*}
\]

Section 1.2. Problem 4.

Section 1.3. Problem 10.

Section 1.4. Problems 2, 4, 10, 19, 38, 40, 51.