1. Look over the Course Home Page.

2. We will begin with linear algebra. What you need to know can be found in Hirvensalo, section 9.3 on Linear Algebra. You also need to get a feel for what linear transformations are like. What they do to spaces, for example. And you need to know about eigenvalues and eigenvectors.

3. Initial Working Groups Problem: Plot the image of the unit circle under the transformation whose matrix is

\[
\begin{bmatrix}
0 & 1 \\
1 & 1
\end{bmatrix}
\]

4. Team Problem: Suppose there are two particles \( p \) and \( q \). At time \( t_0 \) \( q \) is located a distance \( d_0 \) from \( p \) and moving directly away from \( p \) in a straight line with speed \( v_0 < c \). \( c \) is the speed of light. Also at time \( t_0 \) a photon leaves the location of \( p_0 \) in the direction of \( q \). The photon \( \rho \) has speed \( c \). Is it possible that the speed of \( q \) increases over time without ever exceeding \( c \) in such a way that \( \rho \) never catches up to \( q \)?

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**Mathematical Basis of Computing: A Workbook**

Howard A. Blair

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**August 29, 2006**

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**September 19, 2006**

1. Team Problem: Construct a homomorphism from group \( S_3 \) onto the group of bits with addition mod 2. (Recap what we did in class.) Now, show that there is no homomorphism from \( S_3 \) onto \( (\mathbb{Z},+) \). Don’t use “brute force”.

2. Translation Groups (aka regular actions).