EE422G Homework #14 (12 points)
Due April 27, 2007
Please pick up your graded homework after 4/30 (Mon) outside FPAT 687.

1. (2 points) Linear Algebra
   a. Find the determinant of \( A = \begin{pmatrix} -1 & 0 & 0 \\ 1 & 3 & 0 \\ 0 & 1 & -4 \end{pmatrix} \)
   b. Find the inverse of \( A \)

2. (5 points) Identify the state matrices A, B, C, D AND the transfer function \( H(s) \) for the following set of equations
   \[
   \begin{align*}
   \dot{x}_1 &= -4x_1 + 3x_2 + 6u \\
   \dot{x}_2 &= -x_1 - 7x_2 - 4u \\
y &= 5x_1 - 3x_2 + 2u
   \end{align*}
   \]

3. (2 points) Obtain a state model for the followings:
   a. \( H(s) = \frac{s + 1}{s^2 + s + 3} \)

4. (3 points) Given the following circuit
   a. Define an appropriate state vector for the above circuit.
   b. Write the output equation in the form of \( y = Cx + Dw \).
   c. Write the dynamics equation in the form of \( \dot{x} = Ax + Bw \). Hint: Use KVL on the two loops indicated in the drawing.