Problems PreCal 1508 PLTL Workshop, October 19, 2011
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Please do the problems that you feel will help your group the most first (you don't have to do them in order). All handouts are available at `http://alex.knaust.info/pltlfall2011/`

1. Solve this system of equations using the inverse matrix.

$$\begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$$

2. Find the matrix A if

$$A = \begin{bmatrix} x & 2 \\ 6 & y \end{bmatrix} \qquad A^2 = \begin{bmatrix} 13 & 8 \\ 24 & 37 \end{bmatrix}$$

3. Lets discover some useful properties of the determinant function of matricies

   (a) Find the determinant of $A = \begin{bmatrix} 2 & 1 \\ -3 & 5 \end{bmatrix}$

   (b) What is the determinant of A^{-1} and how is it related to the determinant of A?

   (c) Show why $\det(k \cdot M) = k \cdot \det(M)$ if M is a 2×2 matrix and k is some real number?

   (d) Is $\det(Q \cdot R) = \det(Q) \cdot \det(R)$ for two 2×2 matricies Q and R?

   (e) Is $\det(Q + R) = \det(Q) + \det(R)$?

4. You have found at least two ways to solve systems of equations, one by performing row-operations on an augmented matrix, and another by multiplying by the inverse of the coefficient matrix. Why do they both work?

   I have the augmented matrix $A_0 = \left[\begin{array}{cc|c} 1 & 2 & 0 \\ 3 & 4 & 0 \end{array}\right]$ and perform the Row-operation $R_2 = -3R_1 + R_2$ to get the augmented matrix $A_1 = \left[\begin{array}{cc|c} 1 & 2 & 0 \\ 0 & -2 & 0 \end{array}\right]$

   (a) How could I have written this equation as $A \cdot X = B$? (X is a matrix of unknowns...)

   (b) How can I describe the row operation as multiplication with a matrix? (Which matrix C must I multiply by A to get to A_1?)

   (c) Can all row operations be represented this way?

   (d) If they can, can you explain how using Gauß-Jordan elimination gives you the same result as multiplying by the inverse?