Math 370 Spring 2006

Homework 2 Due Wed., 2/1

Ch 5.4 # 7, 9, 11, 15, 26
Ch 5.5 # 1, 3, 5, 7, 17, 19, 21
Ch 6.1 # 1, 3, 9, 13, 17, 21, 23, 25, 27, 29

Problem A:

Give an example of two matrices A and B so that AB = 0 but BA ≠ 0.

For problems B & C:

The 2x2 "rotation" matrix is $R(\theta) = \begin{pmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{pmatrix}$. For example, $R(30°) = \begin{pmatrix} \sqrt{3}/2 & -1/2 \\ 1/2 & \sqrt{3}/2 \end{pmatrix}$

Problem B:

i) What is R(45°)?
ii) Let $\mathbf{u} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$, $\mathbf{v} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$, $\mathbf{w} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$. Sketch these three vectors.
iii) Sketch the vectors R(45°)**u**, R(45°)**v**, R(45°)**w**.
iv) What did multiplication by R(45°) do to these vectors?
v) What does multiplication by R(120°) do to these vectors?

Problem C:

i) Prove that $R(\alpha)R(\beta) = R(\alpha + \beta)$
(hint: use a sum-of-angles identity)
ii) Explain this equation from a geometric point of view.

Problem D:

The matrix $P = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$ is called a "projection" matrix. Describe, geometrically, the effect of multiplying a 2-vector by this matrix.