

Homework #11 (extra credit)

Math 250a

Section 2, Professor J. M. Cushing

Due: Tuesday, December 2

1. Perform the matrix multiplications below.

$$(a) \begin{pmatrix} -1 & 2 \\ 1 & \frac{1}{2} \end{pmatrix} \begin{pmatrix} 2 & -1 \\ 1 & 4 \end{pmatrix} =$$

$$(b) \begin{pmatrix} c & 3 \\ 1 & 6 \end{pmatrix} \begin{pmatrix} 2 & -5 \\ -\frac{2}{3} & 2 \end{pmatrix} =$$

$$(c) \begin{pmatrix} 0.6 & 1.5 \\ 0.2 & 0.9 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \end{pmatrix} =$$

$$(d) \begin{pmatrix} 0.6 & 1.5 \\ 0.2 & 0.9 \end{pmatrix}^2 \begin{pmatrix} 2 \\ 1 \end{pmatrix} =$$

$$(e) \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} \begin{pmatrix} \cos \theta \\ \sin \theta \end{pmatrix} =$$

2. Determine whether the matrices below have an inverse or not. For those that do have an inverse, find it.

$$(a) \begin{pmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{1}{2} \end{pmatrix}$$

$$(b) \begin{pmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$$

$$(c) \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$$

$$(d) \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

$$(e) \begin{pmatrix} b & 1 \\ 1 & 1 \end{pmatrix} \text{ where } b \text{ is a constant.}$$

3. Solve the equations below for x, y using matrix inverses.

$$(a) \begin{cases} 2x + 4y = -2 \\ \frac{1}{2}x + 2y = 0 \end{cases}$$

$$(b) \begin{cases} 0.5x + 0.4y = 1 \\ 0.6x + 0.5y = 1 \end{cases}$$

4. Find the eigenvalues of the matrices below. For each eigenvalue, find all eigenvectors.

$$(a) \begin{pmatrix} 2 & 2 \\ 3 & 1 \end{pmatrix}$$

$$(b) \begin{pmatrix} -7 & -9 \\ 3 & 5 \end{pmatrix}$$

$$(c) \begin{pmatrix} 1.5 & 0.5 \\ -2 & -1 \end{pmatrix}$$

$$(d) \begin{pmatrix} b & 2 \\ 1 & b \end{pmatrix} \text{ where } b \text{ is a constant}$$