

Math 10460 - Honors Mathematics II
Homework 8c - Due Wednesday, March 16

Let

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} 4 & -2 \\ -3 & 1 \end{pmatrix}$$

and let

$$\vec{u} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}, \quad \vec{v} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}, \quad \vec{w} = \begin{pmatrix} -2 \\ 9 \end{pmatrix}$$

Compute the following quantities

- (8) $A\vec{u}$
- (9) $A(\vec{v} + \vec{w})$
- (10) AB
- (11) CA
- (12) A^{-1}
- (13) $(AC)^{-1}$
- (14) $B\hat{i}$
- (15) $A\hat{j}$
- (16) Write down a matrix D such that $D\hat{i} = \begin{pmatrix} 4 \\ 7 \end{pmatrix}$ and $D\hat{j} = \begin{pmatrix} -2 \\ 24 \end{pmatrix}$.
- (17) What is the rotation matrix $R_{\pi/4}$?

Recall the following trig identities

$$\begin{aligned} \sin(\theta \pm \varphi) &= \sin \theta \cos \varphi \pm \cos \theta \sin \varphi \\ \cos(\theta \pm \varphi) &= \cos \theta \cos \varphi \mp \sin \theta \sin \varphi \end{aligned}$$

- (18) Show that $R_\theta R_\varphi = R_{\theta+\varphi} = R_\varphi R_\theta$.
- (19) Find R_θ^{-1} .
- (20) For a matrix A , $A^n = \underbrace{AA \cdots A}_{n\text{-times}}$. Find the matrix R_θ^n .