

<u>Help</u>

sandipan\_dey ~

**Discussion** <u>Course</u> **Progress** <u>Dates</u> <u>Calendar</u> <u>Notes</u>

## ☆ Course / Unit 4: Matrices and Linearization / Recitation 13: Matrices

(1)

Next >

2. Rotations □ Bookmark this page

< Previous</pre>

Recitation due Sep 15, 2021 20:30 IST



**Practice** 

## Rotate a Vector

1/1 point (graded)

Recall:The rotation matrix 
$$R_{ heta} = egin{pmatrix} \cos heta & -\sin heta \ \sin heta & \cos heta \end{pmatrix}$$
 .

Find a two-dimensional vector v such that the angle between v and the vector  $igg(rac{1}{2}igg)$  is  $30^\circ$  . There is more than one possible answer.

(Enter a vector using notation such as [a,b].)

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#### Solution:

We have 
$$v=R_{rac{\pi}{6}}\left(rac{1}{2}
ight)=\left(rac{\sqrt{3}/2-1}{\sqrt{3}+1/2}
ight)$$
 .

It would also be correct to answer  $R_{rac{-\pi}{6}}v=\left(rac{\sqrt{3}/2+1}{\sqrt{3}-1/2}
ight)$  , or any scalar multiple of these.

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You have used 1 of 5 attempts

## Answers are displayed within the problem

## Rotate twice

1/1 point (graded)

Let 
$$M_1=R_{rac{\pi}{3}}$$
 and  $M_2=R_{rac{\pi}{6}}$  . Find the matrix product  $M_1M_2$  .

(Enter a matrix using notation such as [[a,b],[c,d]].)

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## **Solution:**

$$M_1 M_2 = egin{pmatrix} 0 & -1 \ 1 & 0 \end{pmatrix}$$
 . This is  $R_{rac{\pi}{2}}$  .

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**1** Answers are displayed within the problem

## **Rotating Complementary Angles**

1/1 point (graded)

Suppose  $\theta$  and  $\phi$  are complementary angles, that is, two angles such that  $\theta+\phi=\frac{\pi}{2}$ . Compute the product  $R_{\theta}R_{\phi}$ . Your answer should not involve  $\theta$  or  $\phi$ .

(Enter a matrix using notation such as [[a,b],[c,d]].)

$$R_{ heta}R_{\phi}= oxed{[[0,-1],[1,0]]}$$
  $ightharpoonup$  Answer:  $[[0,-1],[1,0]]$ 

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#### **Solution:**

The product 
$$R_{ heta}R_{\phi}=R_{ heta+\phi}=R_{rac{\pi}{2}}=egin{pmatrix} 0 & -1 \ 1 & 0 \end{pmatrix}$$
 .

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You have used 1 of 5 attempts

**1** Answers are displayed within the problem

## Power of rotation

1/1 point (graded)

Let  $M=R_{rac{\pi}{4}}$  . What is the smallest value of k>0 such that  $M^k=I$ ?

#### **Solution:**

The product  $R_{\theta}R_{\phi}=R_{\theta+\phi}$ . It takes 8 rotations by  $\pi/4$  to come back to the start. Therefore k=8, or any integer multiple of 8.

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## 2. Rotations

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