

**WORKSHEET 2/22/23**  
**MATH 2331, SPRING 2023**

(1) Let  $\mathfrak{B} = \{\vec{v}_1, \dots, \vec{v}_m\}$  be a basis for  $\mathbb{R}^m$ . If  $[T]_{\mathfrak{B}}$  is a diagonal matrix, what can you say about  $T(\vec{v}_i)$ ?

(2) Is there a basis for  $\mathbb{R}^2$  in which a 90 degree rotation is represented by a diagonal matrix?

In the remaining problems,  $\vec{u}_1 = \frac{1}{2}(1, 1, 1, 1)$ ,  $\vec{u}_2 = \frac{1}{2}(1, 1, -1, -1)$ , and  $\vec{u}_3 = \frac{1}{2}(1, -1, 1, -1)$ .

(3) Are the vectors  $\vec{u}_1, \vec{u}_2, \vec{u}_3$  orthonormal?

(4) Can you find a vector  $\vec{u}_4$  such that  $\vec{u}_1, \dots, \vec{u}_4$  are orthonormal?